THE REFINER AND NATURAL GASOLINE MANUFACTURER

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New Ton Process for the Manufacture of Absorption Gasoline Now Being Used by California Concerns.

A New Article by Jacque C. Morrell and Gustav Egloff on the Congealing Temperature and Other Fuel Characteristics of Cracked Residue.

Welding Proving Popular Among Oklahoma Gasoline Plants. Story With Illustrations Showing Uses of this Method in Plant Construction.

What Happened at the Galveston Convention.

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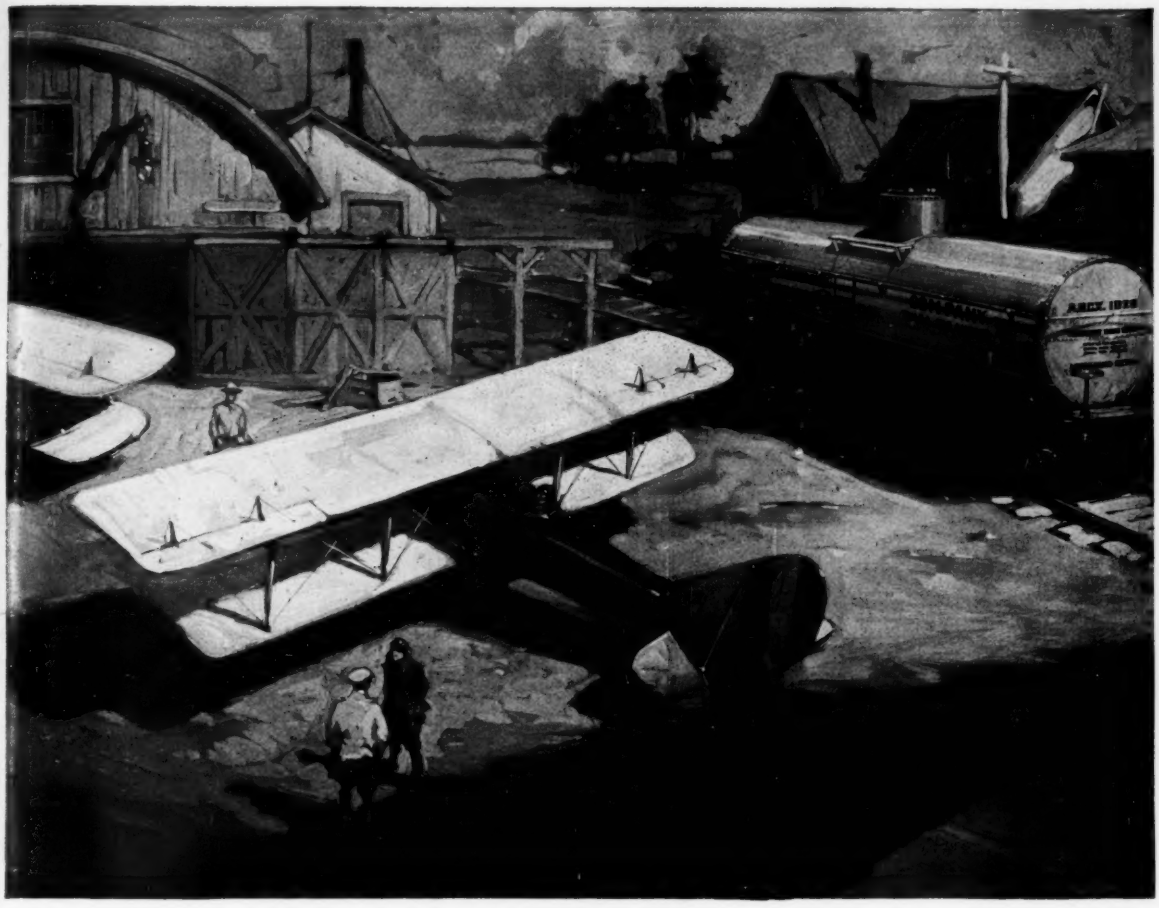

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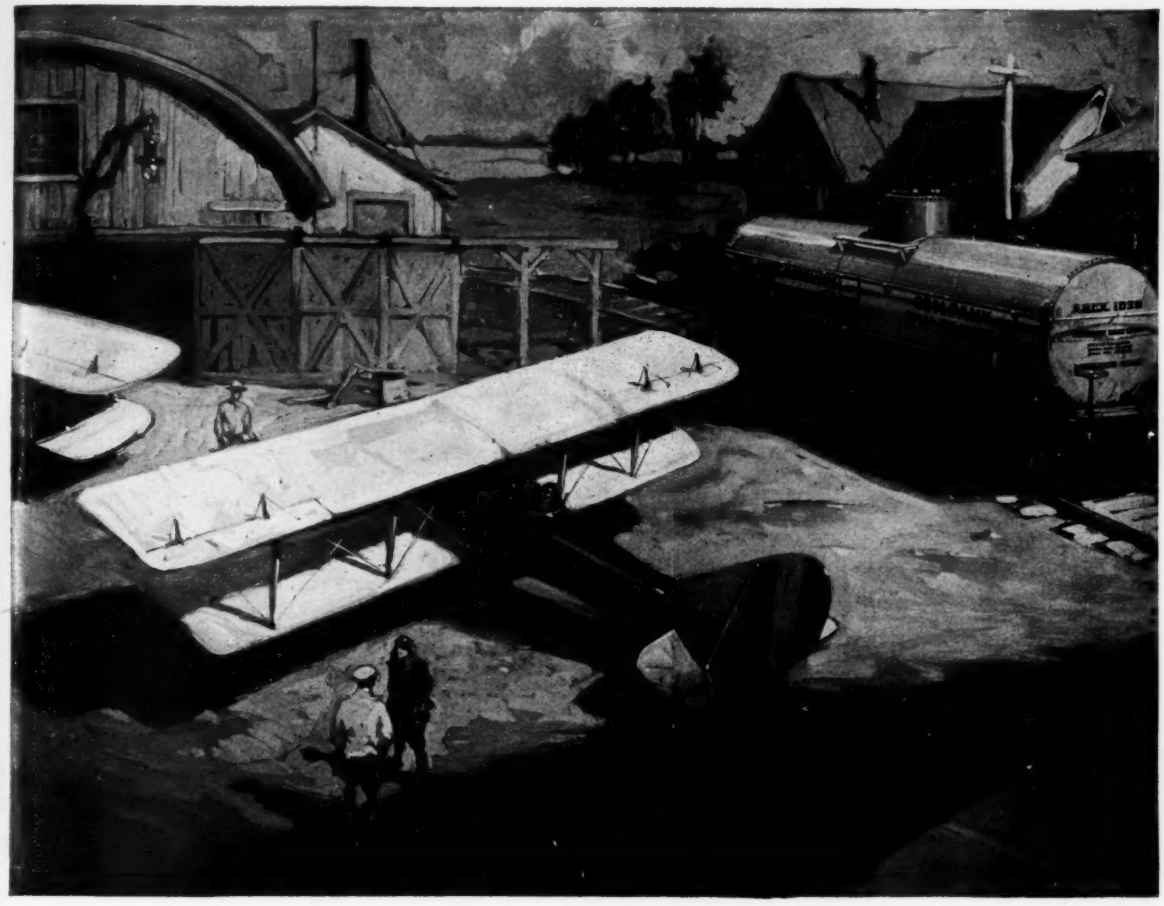

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For men engaged in the operating branch of the refining and natural gasoline business.

Vol. 2 April No. 4

R. L. DUDLEY..Manager and Editor

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Moore Again Chosen President of Refiners

Galveston meeting one of best yet—D. W. Moffitt tells of industry's greatest menace

By Spencer W. Robinson

Galveston, Texas.—Hitting the nail squarely on the head and bringing the three day meet of the Western Petroleum to a close with a bang, D. W. Moffitt presented in his address on "Petroleum Marketing Problems" the circumstances of what he termed the "greatest menace" now facing the refining industry.

While not particularly censuring the marketing division for its present condition, Mr. Moffitt pointed out that due to the important position occupied by that branch of the business through its direct connection with the public or ultimate consumer, that it should come under the supervision of the refining department. The idea as stressed by Mr. Moffitt was not to destroy but to direct the sales division.

In this connection Mr. Moffitt offered a solution to the present situation through the organization of a number of self financed marketing divisions in which the refiners would have some say. Details of this suggestion will be found later in this article.

The three day session, beginning on April 10 and ending with a banquet on the night of the 12th, was written into the record as being one of the most constructive and successful yet held by the refiners. A large attendance representing practically every refining locality in the country was on hand to enjoy the annual meet, which was divided equally between business and pleasure.

Moore Re-Elected

Expressing their faith in the administration of the association and its accomplishments throughout the past year, members re-elected George N. Moore of Chicago at the business meeting held Thursday morning as president of the association for the coming year. He will be assisted in his executive work by P. M. Miskel, Tulsa, Okalahoma, first vice president; Roy B. Jones, Dallas, second vice president; W. L. Kistler, Chicago, third vice president, and a board of 25 directors.

The following were elected directors for the coming year: Newly elected, H. H. Champlin, Enid, Okla,; James Corbett, Wichita, Kan.; R. R. Irwin, Kansas City; L. N. Openheimer, Tulsa; W. O. Shock, St. Louis; M. M. Welch, Tulsa; J. L. Walsh, Kansas City, and Frank M. Smith, Dallas, Texas. Old members of the board re-elected are: H. T. Ashton, St. Louis; W. H. Cannaday, Chicago; S. C. Collins, Ponca City, Okla.; H. B. Earhart, Detroit; E. W. Gobel, Kansas City, Kan.; Elliott Jones, San Antonio; C. M. Lamason, Tulsa; G. D. Locke, Chicago; W. E. MacEwen, Cleveland; C. L. Mayhall, Tulsa; T. P. Melvin, Tulsa; J. H. Miller, Kansas City; E. R. Perry, Tulsa; F. A. Pielsticker, El Dorado, Kan.; O. D. Robinson, Pittsburgh; W. R. Hamilton, Wichita Falls, Texas, and C. L. Henderson, Wichita, Kan.

The executive committee for the next year is composed of the following officers and directors: George N. Moore, P. M. Miskell, Roy B. Jones, W. L. Kistler, E. R. Perry, G. D. Locke, Elliott Jones, J. H. Miller, S. C. Collins, H. T. Ashton and F. A. Pielsticker.

The Association denounced the La Follette report to the senate in a resolution which was unanimously adopted. The resolution stated that the charge of the investigating committee that prices of crude oil and its products are arbitrarily controlled is unfounded and not warranted by the facts. In referring to the report Mr. Moore said:

"The suggestion from the seat of our government that dollar gasoline is in sight is so far remote that it need not concern the present generation.

"The agitation raised by assailants of the oil industry has failed to delude the public, as there has been no evidence of alarm as a result of the charges. The oil industry is not exploiting the public, but is governed like any other business by the law of supply and demand."

A plea for closer co-operation between refiners and the railroads was made by representatives of the various Mid-Continent transportation divisions who spoke before the convention.

Another feature of the meeting furnished by large export concerns was a report on the present outlook for greater export business. Leland V. Stanford, vice president of the Union Petroleum Company, recounted some of the experiences of his concern in building up a refined market in Europe and was very optimistic in his statements that foreign countries are now offering one of the greatest markets for the Mid-Continent refiner.

Petroleum Code

W. B. Hamilton, with the Texhoma Refining Company of Wichita Falls, Texas, was chosen chairman of a committee to investigate the McClure general petroleum code which was later adopted unanimously. Other members of the committee were Roy B. Jones and L. N. Oppenheimer. The code is being printed and will be offered to the trade in the near future.

Recommendations were made to transfer the general headquarters of the association from Kansas City to Tulsa. This suggestion was set aside to be acted upon later at a meeting of the executive committee to be held in Kansas City.

The convention opened with the usual registration, totaling over 150, which was followed by the reading of the annual report by President Moore. The substance of the annual report was that indications point to a decided improvement in the marketing situation from the refiner's standpoint and the coming season should prove a great one for the industry.

Following the annual report James F. Holden, vice president of the Kansas City Southern Railway, spoke on the subject "Railroads and Oil Traffic."

In his speech Mr. Holden pointed out that petroleum and its products formed

The cover design shows a tanker in the Gulf of Mexico just off the shore at Galveston where the last annual convention of the Western Petroleum Refiners Association was held.

XUM

WESTERN PETROLEUM REFINERS CONDEMN LA FOLLETTE REPORT

Whereas, the remarkable growth of the petroleum industry with the tremendously increased demand for petroleum products is due to a world wide economic development and has resulted in a corresponding development of commercial and industrial activity, and

Whereas, the Western Petroleum Refiners Association, whose membership is composed of sixty-nine (69) independent refining companies located in the Mid-Continent field, has carefully considered the recent report of the senate committee, generally referred to as the La Follette committee, and has deemed it appropriate to give expression to its views with reference to that report at its annual meeting, now in session at Galveston, Texas,

Now, Therefore Be It Resolved:

That the association condemns the report of the committee as a misleading and distorted presentation of the real facts with respect to the petroleum industry.

That the method of conducting the investigation was such as to preclude a full and impartial disclosure of those facts by the industry as a whole.

That the growth of the independent branches of the industry has been strong, substantial and in larger proportion to the entire industry than the growth of the standard companies.

That the growth of the independent producers, refiners and marketers has been so great that their margin of supply, in relation to demand, inevitably has a profound effect upon production and prices.

That the charge of the committee that the prices of crude oil and its products are arbitrarily controlled is unfounded and not warranted by the facts.

That the rapid growth of the independent branches of the industry is conclusive evidence that keen competition exists within the industry, and

That this competition is healthy and legitimate, and that the effect of government control would be to weaken the position of the independents in the industry to their detriment and that of the public.

9 per cent of the increase in the total originating traffic handled by railroads between the year 1911 and 1920. Figures were cited to show the necessity for increased rates and the needs for new financing.

A nominating committee was appointed at the close of Mr. Holden's speech and the Executive Committee went into private session. A dance was given as entertainment in the evening at the Hotel Galvez ball room.

The second day got under way with the prepared paper of Judge C. D. Chamberlain on "How Legislation Inimical to the Oil Industry Should Be Opposed," read by F. D. Dow of Washington. The judge was unable to attend the meeting.

This reading was followed by an address given by J. R. Koontz, vice president of the St. Louis and San Francisco Railway.

Export Situation

At the Wednesday luncheon Leland V. Stanford, vice president of the Union Petroleum Company, addressed the members on European conditions. Mr. Stanford stated that even though times seem rather gloomy at present, in his opinion that within the next 30 or 60 days conditions would be materially improved and that his company expected to again be in the market for millions of gallons of refined products at a price much higher than those prevailing today.

In his speech Mr. Stanford brought out some of the following points as regarding the market situation in Europe:

"The sale of gasoline in England and other countries in Europe is handled in a somewhat different manner than that in this country, inasmuch as the consummers over there know exactly the grade of gasoline that they are getting. For instance, if you are marketing navy gasoline, you must so tell the consumer. The same is true regarding the 64 gravity gasoline.

"There was an edict issued in France which has a very important effect on the European situation as regards the marketing of gasoline. The French release 10 per cent in alcohol of the total finers were compelled to purchase at quantity of gasoline they might import. Now the refiners, as a whole, were very much opposed to that edict, and endeavored to have it annulled, but without avail. It was originally contemplated that the alcohol was to be shipped to the various refineries and there blended. However, the refiners grouped themselves together and thought of a better plan which was entirely satisfactory to the government. They now ship their per cent of gasoline required under the edict to a centralized station, at which station it is blended, then returned to the respective refiner. The blended product is then placed directly before the consumer, and he is given the choice of purchasing either that grade at a slightly lower cost, or either one of the two regular grades of gasoline which they have always been marketing.

"It is the consensus of opinion among the French refiners that the quantity of the blended product sold will be so small that they will be able in time to have this edict withdrawn, in which event the imports would be inceased at least 10 per cent."

"We are confronted today with a new problem of marketing in Europe, due to the refining policy that has been adopted by the Anglo-Persian Company. They have, as you know, established a large refinery at Swansea, which, at present, is actually producing over 300,000 gallons of gasoline per day. The refinery is operating on Persian crude, which readily yields over 30 per cent of 64 gravity 365 end point. It is undestood that not only the refinery at Swansea is to be enlarged, but two other refineries are to be built, one at Orangemouth, Scotland, and the other at Marsailles, France. It is expected that by 1925 the total through put of this company's refineries would reach 35,000,000 barrels of Persian crude per year.

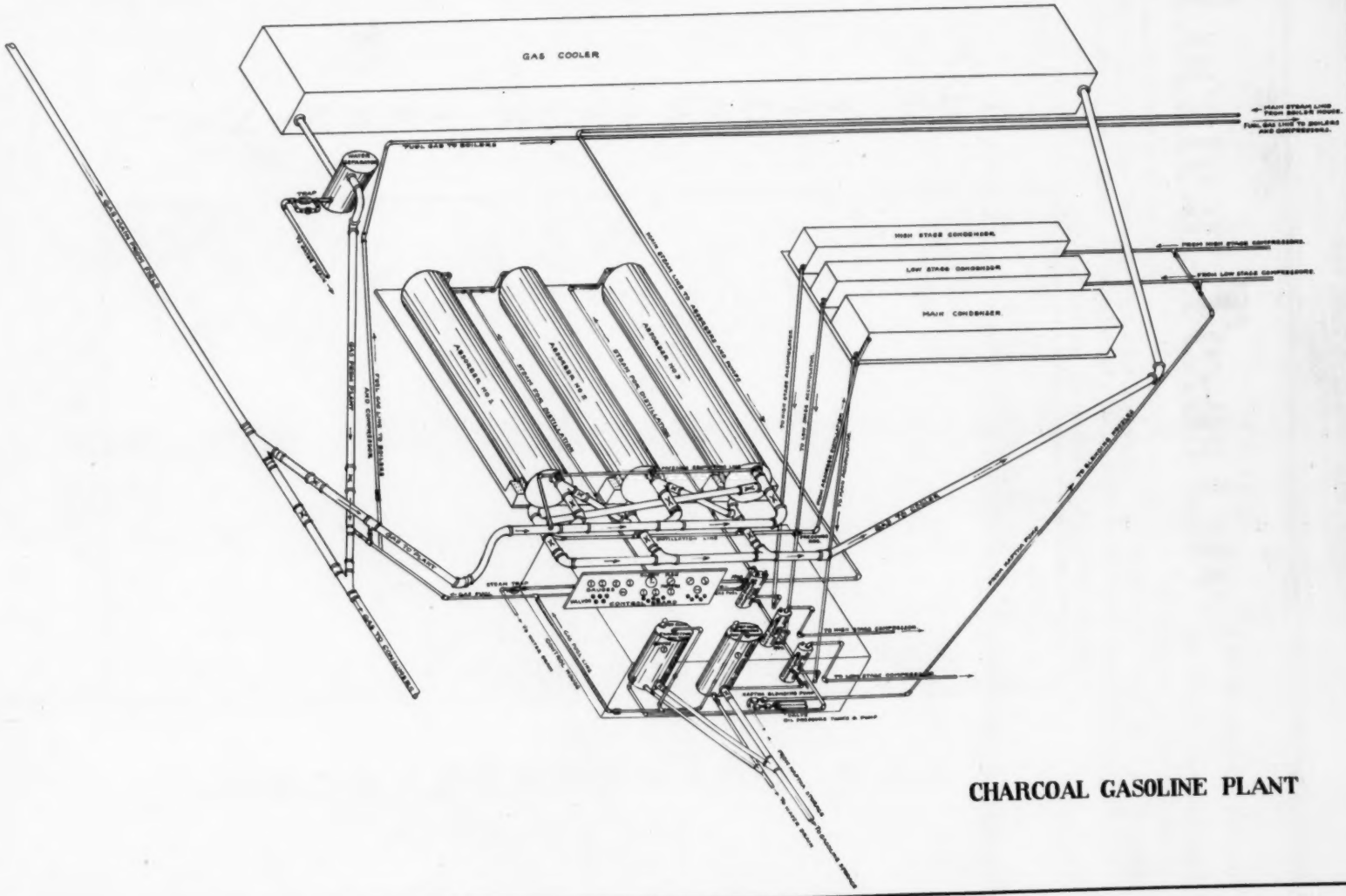
"It is very interesting to note that Russia is once again exporting petroleum products. About two months ago we received a firm and bona fide offer from a very reliable concern to deliver to us at any port along the Atlantic Coast a cargo of Russian kerosene at a price of one-quarter of a cent below the market price at that port. In other words, if the market on kerosene, for instance, at any gulf port was 5 cents per gallon, f.o.b. tanker, this company was agreed to deliver into our tanks the Russian kerosene at 4¾ cents per gallon. It is needless to say what our answer was, for we would not even consider such a proposition had they been willing to give us the kerosene without cost; but it just shows what is happening in Russia.

"During the past six months, and up to about two weeks ago, there has been a great price war going on in Belgium. We started a company over there right after the war, with considerably over a million dollars invested. Everything was going along very smoothly, and we had secured approximately 20 per cent of the business in Belgium, when one of our large competitors seemingly undertook to put us out of business, lowering the price on 64 gravity gasoline, so that we were forced to sell at a figure which netted back to us, at New Orleans, about 5 cents a gallon. You can readily see that we did not make much money selling at such a price. However, I am very glad to state that when it was finally determined it was our intention to go right along retaining our customers, no matter at what price we might be forced to sell. The company referred to above ceased their cutting of prices, and the market there today is practically the same as that in France.

"Up until about two years ago it was the custom to ship practically all lubricating oils abroad in barrels, but that practice has changed, and the majority of shipments are now made in bulk, this being due to the fact that it was cheaper for the European to do his own barreling on account of the very low labor cost. However, from information we have recently received, it would appear that buyers would perhaps revert to the old method of shipment. There is quite a shortage of raw material in Europe from which barrels are made, and in order to obtain this material it would be necessary for them to purchase it in the United States; consequently, it is reasonable to suppose that instead of purchasing the raw wood, they would buy the finished barrel, and would not ship that barrel over empty. Then, too, ocean freight rates on barrel goods have been reduced to such a point that at present it is about equal in cost, or perhaps a little cheaper, to ship in barrels instead of in bulk.

"A successful export business can not be built up by considering Europe or any other foreign country as a dumping ground for excessive stocks of American products. Such business, while perhaps temporarily relieving stocks of the American company, does not entitle the company to the name of exporter in the full sense of the word. Success in this field must be considered over a period of years, not months, and the spasmodic selling of distressed lots in a foreign market has been known to instigate a price war which raged long after the chance shipment had been disposed of. The direct result was that the old established exporting houses were forced to so reduce their prices to foreign customers that the net back to their American supplies, or the prices they could offer for further supplies, were disappointingly low, and probably in many cases below the prices to be obtained in the domestic market.

"One of the most important messages that I might bring to you today is the



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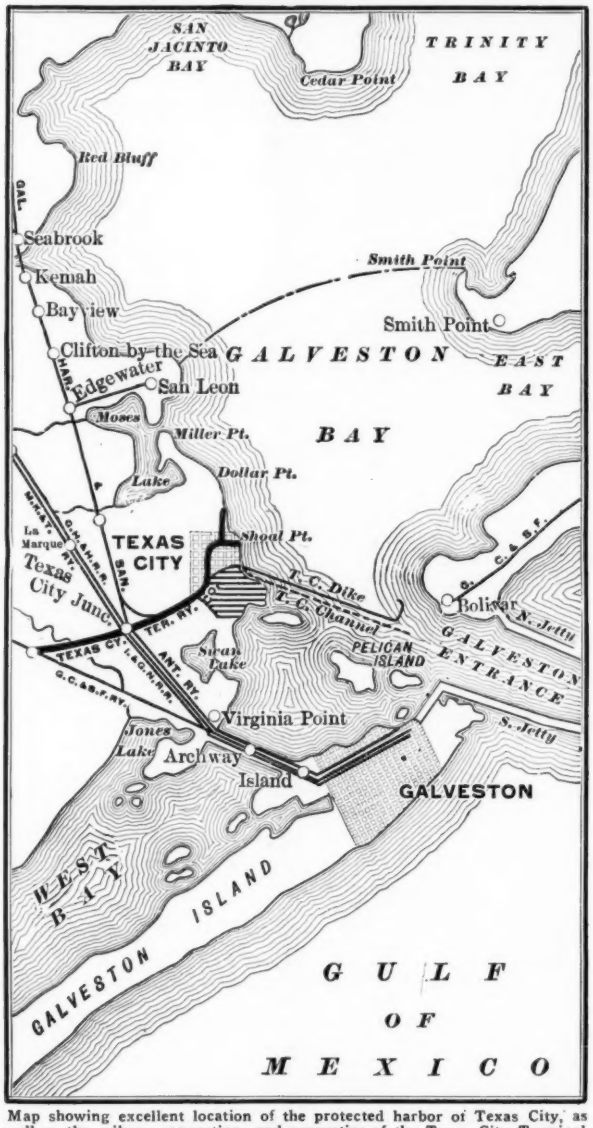

THE PETROLEUM PORT

Map showing excellent location of the protected harbor of Texas City, as well as the railway connections and properties of the Texas City Terminal Railway Company

Petroleum Interests now concerned at the Port:

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Humble Pipe Line Company
Vacuum Oil Company
U. S. Gasoline Mfg. Corporation
Swiftsure Oil Company
Swiftsure Petroleum Company
Marland Oil & Refining Company
Pierce Oil Corporation
Terminal Oil & Refining Company
U. S. Texas Oil Corporation

TEXAS CITY TERMINAL RAILWAY COMPANY

E. A. BYNUM
Vice President and General Manager,
Texas City, Texas

E. C. GUION
Vice President in Charge of Traffic,
Galveston, Texas

fact that European buyers have now begun to realize that there are just as good lubricating oils produced from so-called Mid-Continent crude as those produced from Pennsylvania crude. It has taken a great amount of work and much time to convince them of this fact. I can now say with positive assurance that the demand for lubricating oils, other than those known as Pennsylvania oils, will be far greater for export in the future, and it is quite pleasing to learn that the foreign buyer is not only satisfied with the Mid-Continent lubricants, but in many cases has really expressed a preference for them."

Gulf Port Rates

Phillip W. Babcock, an oil exporter of New York, spoke at the Thursday morning session of the meeting on "Why Ocean Freight Rates Should Be Reduced from Gulf Ports to European Countries."

The possibilities of reducing cargo rates from gulf ports so impressed the refiners that a committee composed of George D. Locke, Barnsdall Refining Company; P. M. Miskell of the Empire Refineries, Inc., S. C. Collins, with the Marland companies, Leland V. Stanford and W. R. Boyd, assistant secretary of the American Petroleum Institute, was appointed to investigate and attempt to secure an adjustment between Atlantic and gulf rates.

The general business session with the election of officers was held Thursday morning.

The meeting came to a close Thursday night with the annual banquet at which D. W. Moffitt, vice president of Cosden & Co., and R. L. Welsh, secretary of the American Petroleum Institute, were the principal speakers. Pat Maloy of Tulsa presided as tosatmaster.

Mr. Welsh gave his time over to reviewing the Washington investigation and the high position held by the petroleum industry in all lines of commercial activity.

Mr. Moffitt's speech in part together with suggestions, follows:

National Specification Law

"Let us now consider a marketing problem which is really a refiners' problem, one which has worried us for years, while a refiner's problem will have to be solved by the marketing department. I think if it is ever solved, and that is the present regrettable variance in the tests of petroleum products, particularly for kerosene and gasoline, whic hare in existence in various states and which are still in course of change and readjustment. It is one of the regrettable things to me, in thinking of state rights, and a person should mention this below his breath in this Southern extremity of the cradle of that doctrine, that in this question of specifications for these staple products of petroleum, as well as in many other things in which for the moment we are not particularly interested, instead of having the matter settled by one national law, adopted under the direction and advice of a commission appointed for the purpose, which could be and would be so framed that the interests of all the people would be protected, we have been and are as yet faced with the possibility of being compelled to meet a different specification for every one of the 48 states into which our products move. As the matter stands today these requirements are framed and adopted by each of the various states and there is a natural tendency on the part of the inspection departments of the various states to, in a greater or less degree, desire to impress their individuality on the requirement adopted and to that extent defeat the very thing they should strive to accomplish, arrive at a nationally uniform specification for at least the two great staples in petroleum products, gasoline and kerosene.

Supreme Problem

"The supreme problem in the marketing end of the refining business, the greatest problem in the refining industry, whether considered from a refining or marketing standpoint. This is the question of the existing avenues through which a great proportion of the petroleum products from the refineries in the Mid-Continent field reach the consumer, channels which today have a tremendous influence on the prosperity of the industry as a whole and which will continue to exert this influence whether 50 or 40 or 30 or 20 per cent of the output of the field moves through these channels, so long as they exist in the form in which they exist today. Twenty years ago the petroleum marketer, as organized and operated today, was practically unknown. This was true because there was little reason for his existence. Refineries were small, their output limited and most of them in existence had their own sales force. I well recall when John Cameron started the Great Western Refining Company at Erie, Kansas, running 600 barrels of oil per day, and we spoke his name in a subdued voice. He had a traveling man who had a real sample case filled with beautifully odored oils, red and blue and white kerosene and a half dozen kinds of lubricating oils, manufactured by a mysterious individual whom he had enticed away from the Pennsylvania oil fields. And then we heard of a refinery in the Glenn Pool, managed by a man named Bill Richardson and running all the oil produced south of the Mason and Dixon line, 2500 barrels per day, and close on the heels of these marvelous developments came a suave and pleasing and persuasive individual with a proposition to form a marketing organization which should be the representative of and handle the output for all the refineries in the Mid-Continent field. It listened good and would have been good if such an arrangement was within the range of possibility, but it was not. It had a skyrocket career, a blaze of light in the sky, an explosion which threw out a myriad of varied colored balls of fire, little bursts of profanity from those whose hopes had been blasted, and the remnants of the concern which was to have been the representative of and handle the production for the Mid-Continent refiners dropped through the darkness like the remnants of any other skyrocket and disappeared. It was destroyed by influences which it could not resist and which has strewn the field of the petroleum industry with numberless wrecks every year since. That skyrocket flare in the sky was a will-o'-the-wisp which has led an innumerable host of others, on the same errand bent, to the same ruin.

"There is an irrepressible conflict between the buyer and the seller in any line of merchandising. There is no exception to this rule in the petroleum industry. The woolen manufacturer who accepts as his adviser as to what he should secure for his goods a man who was the representative of the retailer who wished to buy the goods of the manufacturer, would be rated, and justly so, as a fool. Here and there we have in the petroleum industry those who represent themselves as buyers for the jobbers. As a general thing they are anathema with the refiners and are looked upon with a fear. * * * * * What is the real purpose to be brought about in the deal? It is the transfer of the money the buyer has to the seller who wants it. And to do that the entire world today is engaged in bending the will of the seller to that of the buyer, for money is the power that makes the wheels of commerce go round, and the party who holds the medium of exchange will be given the advantage over the party who wishes to obtain it. It is admitted that many of the difficulties I have mentioned would be overcome if the sales agencies were under the control and ownership of those engaged in the industries whose products they handle. A large proportion of the petroleum products are so handled. Many of the plants, in fact, a large per cent of them, have their own agencies or sales department, but there is a sufficient proportion of the output of the field moving through agencies which are neither owned nor in any manner controlled by those whose products they handle to control the situation and form the basis upon which the products of the field as a whole must be marketed. I am not pleading for destruction of the existing sales agencies. I at one time believed that they all should go, but the industry has expanded to such an extent, there have grown up such a number of small units which can not support sales departments, the marketing territory has widened to such a degree, that unless the small refining units were absorbed by larger ones I feel that if these were not sales agencies already organized it would be necessary to form them. What I am pleading for, what I have pleaded for for years past, are sales agencies which, in consideration of being recognized as the official agencies of the refiners whose products they handle, should in fact be the representatives of the refiners, willing to work with and from them, in a fair and just and equitable relation to the jobber, to the end that a reasonable amount of stability be brought to both departments of the industry, something which never has obtained, but which is, I hold, easily within the range of possibility and good business practice.

What Should Be Done

"I marvel why this vision has not come to some of our good marketing friends! Just why it has not occurred to them that this is a field worth developing, that holds in its greater promise for achievement than has ever been accomplished in the past. What would be some of the advantages to be reaped through such an arrangement?

(Continued on page 22.)

Newton Process for Recovering Still Gas

Method described as "Jitney Unit" not adapted to the manufacture of gasoline from natural gas

By B. V. Ellzey

NEWTON Process gasoline absorption plants have created more interest among the West Coast operators than anything that has been added to the industry in recent months, and plans are now under way for increasing greatly the number of plants in operation in California, as well as offering the equipment to the Rocky Mountain, Mid-Continent and Gulf Coast States.

A brief and general description of one of the Newton Process plants was given in The REFINER and Natural Gasoline Manufacturer January, describing it as the "Jitney Unit." The interest aroused by that discussion has brought inquiries from all parts of the United States, until the owners of the process have been swamped with requests for further and more detailed information, and with orders for installations.

The distinguishing features claimed for a Newton Process plant are: Simplicity, economy in construction and economy of operation, adaptability to any requirements by variation in capacity of units, efficiency in stripping the gas clean, portability of physical equipment, and adjustability to any and all kinds of gases and vapors. One particular plant, located on a Montebello lease of the Saint Helens Riverside properties, has been studied in detail by a representative of this journal, together with the inventor of the process, and the figures and data used in this discussion are taken from records established by this particular plant. It is claimed, however, that this is a typical plant so far as the equipment and arrangement of materials are concerned, and the only difference between it and any other plant using the same process would be in the initial cost, since the particular plant studied was built by labor in the employ of the oil producing company, and a good deal of the materials were furnished from stocks of the company.

The plant is capable of handling 3,000,000 cubic feet of gas a day, averaging three-quarter gallon of gasoline to the thousand cubic feet, and the total cost of construction was $12,000. This cost, it has been pointed out, is not representative, and the ordinary cost of any plant similar in capacity and arrangement would run about $25,000. This does not include the cost of gathering lines, nor of steam for operation of the plant. The steam is provided by a pumping boiler not far away, as very little steam is used. The plant will produce 2000 gallons of commercial gasoline a day, at a cost for operation of $1.50 a day. There is another plant on the same company's property at Fullerton, which has been in operation for three years, with a daily capacity of 175,000 cubic feet of gas, and which cost $3800 to construct. Its net earnings are $1000 a month, and operation cost is $1.50 a day. No repairs have been necessary.

Plant Automatic

It is claimed that the plants are as near automatic as it is possible to make an assemblage of machinery. The only expense of operation is for labor. At no place has it been necessary to employ additional labor because of the location of the plant on the producing lease, and the item of $1.50 a day given above was distributed between three oilers employed on the producing lease, giving them 50 cents a day, one at each shift, to see after the gasoline plant. This was simply in the form of a bonus for their kindness, since they lose no time from their other work in "taking care" of the gasoline plant.

There are four plants in operation in California, using the Newton process, and others being constructed, with additional orders booked, to be taken care of as soon as the equipment can be made. A company has been formed for the manufacture of the equipment, and another company has already been organized with sufficient financial backing to introduce the plants and construct them in the states of Wyoming, Montana, Colorado, Kansas, Oklahoma, Arkansas, Texas and Louisiana. A first plant for the Mid-Continent will be built just outside of Tulsa during the next few months, and a second one will be built in a field near Tulsa.

D. L. Newton, inventor and patentor of the process, points out that the plant is not only adaptable to the manufacture of gasoline from natural gas, but will be an ideal unit for the recovery of gasoline from uncondensed still vapors at oil refineries. He pointed out that there is a need for such equipment, and he expects his patents to find a ready demand for this purpose.

The plant which was studied in detail by the writer is handling a rather poor grade of gas, and is producing a commercial gasoline, water white without treatment, testing 62-64, and said to be giving unusual satisfaction as a motor fuel. An independent company having a string of service stations sends its own truck tank right to the plant, and delivers the gasoline from the stock tank to the underground tanks at the filling stations. Details of how the gravity of the product is controlled, the initial and the end points, and the other characteristics of the gasoline regulated will be given in the description of the equipment and its operation.

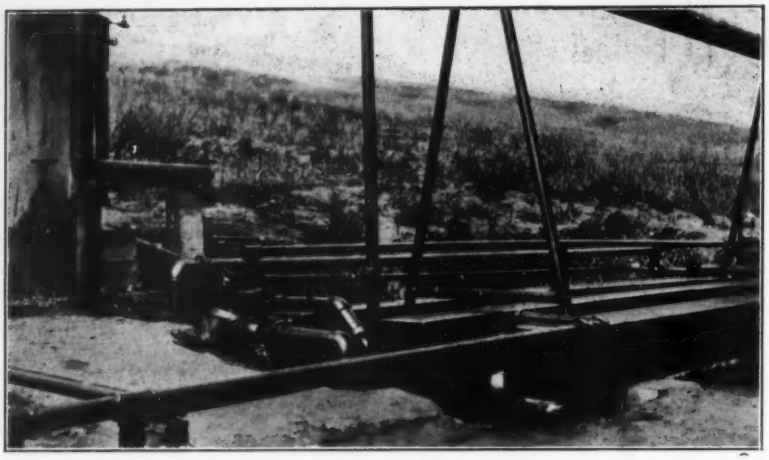
Only two pieces of physical equipment about the plant are patented, the absorber and the still. These, along with all the other items necessary in the complete plant, will be manufactured and sold by the company holding the patents, but no royalty of any kind will be charged, and the only profits which will accrue to the company will be from the manufacture and sale of the equipment.

The complete list of equipment consists of four small pumps, absorber, still, dephlegmator, heat interchangers, pre-heater, auxiliary vapor absorber, cooling tower, pipes and fittings, and small water jacketed corrugated tanks. There is one six-horsepower pump for circulating the oil, one small reflux pump, one small water pump and a little gasoline pump. A special lubrication system has been devised for the pumps, connection with a drum of lubricating oil under pressure, such that the lubrication is automatic and requires no attention except to refill the 42-gallon drum every few weeks. The steam for this plant comes from a nearby pumping well, and the turning of one valve in the steam line stopped the entire process of the gasoline plant. After standing suspended for 30 minutes the steam line was opened and within a very few minutes every part of the gasoline plant was under normal and rythmic operation.

Absorber Oil Used

The absorber oil used may be of almost any character, depending upon

Close up view of the Newton absorber and still. These are the only patented pieces of equipment in use.



Heat exchangers of the Newton process on the ground showing a partial view of the dephlegmator above

the nature of the natural gas, and upon the specifications to which the final product is to be built. In this plant a rather lean gas is being used, and a 62-64 commercial gasoline being produced without blending and without treatment. The absorber oil used is a stove oil, capable of yielding a small percentage of gasoline when re-run, and this pulls down the gravity of the final product to the desired point. If a very low gravity absorber oil were used, the resulting product would be a high gravity raw casinghead gasoline. And since a small percentage of the absorber oil distills out in the process, it is necessary to add a small volume of absorber oil to the tank occasionally.

The absorber oil leaves the tank at a temperature of 80 to 160 degrees, depending upon the use made of the oil as it came through the dephlegmator. This oil goes to the cooling coils, and the temperature is reduced to about 70 degrees, and it is delivered then to the absorber.

The absorber is one of the patented features of the plant. It can be built in sizes to accommodate any capacity of plant. It is divided into three compartments, horizontally, in each of which the same operation takes place. The wet gas coming in at the bottom of the absorber is forced up through small apertures into the first oil level, and up through the oil, to the top of the first compartment. Here it is forced by pressure to pass to the next higher level through a pipe connecting with the base of the next compartment above. The same process takes it to the third and top compartment, by which time it has been stripped of the condensible hydrocarbons. The dry oil is pumped into the absorber at the top, and forced down to the lower level through outside pipe connections. At each level the oil and gas are in contact under pressure, and this pressure may vary from two to 150 pounds. In this plant the pressure is maintained at 25 pounds. The dry gas passes out at the top, and the saturated oil at the bottom of the absorber, at exactly the opposite ends at which each entered.

The absorber cleans the gas to a residue of one pint to the thousand cubic feet, and 25 gallons of oil are circulated to each gallon of gasoline produced.

The fat oil goes through the heat interchangers, and into the pre-heater. By this time the oil has been elevated in temperature until at the time it leaves the pre-heater it is at 245 degrees. Exhaust steam from the pumps with a back pressure of 15 pounds raises the temperature of the oil to 245 by the time it leaves the pre-heater. It enters the still at 245 and is raised to 260, and the final separation of vapors from the absorber oil takes place. The still is patented, and demands a bit of explanation.

There is a compartment of live steam at the bottom of the still and surrounding the myriads of small tubes. The fat oil is pumped in near the base of the still, and forced up through one set of tubes, to flow down the other set of tubes. As it flows down it is not forced so that it does not fill each tube, but flows down the sides of it, leaving an opening up through the center through which steam rises, lifting off all remaining condensible vapors. It is known that four factors affect evaporation: time, heat, pressure and area. These factors are so regulated in this still that it is claimed that as complete evaporation of the condensible hydrocarbons is obtained as it is possible to obtain under practical conditions. The denuded oil leaves the still at the base, and the vapors leave at the apex, for condensation. It is an evaporating still, with no hot spots, and gives uniform distillation. The temperature is controlled by a steam pressure regulator, and the temperature of the oil is controlled by a steam regulator. The still capacity is 2500 gallons a day. The denuded oil leaves the still and goes through the heat interchangers, back to the tank ready for a second circulation.

It is a continuous operation, and practically automatic.

A part of the cold oil goes through the dephlegmator to control the end point of the gasoline produced, and a part goes through the auxiliary vapor absorber to absorb the uncondensed vapors from the gasoline cooler coils. The charged oil is mixed with the heavy ends from the dephlegmator and is directed into the main stream through the heat interchangers and into the still, where it is distilled with the main volume of oil. Through the operation of the dephlegmator and the auxiliary absorber the initial and end points of the product can be controlled, and a uniform product produced. It is said that the fractionating scale is unusually satisfactory, and that the product is a motor fuel of very high quality.

The cooling tower is 20 feet high, 20 feet wide and 44 feet long. It has a concrete pit two feet deep. Ninety joints of 2-inch pipe are used in the oil cooling coils, and there is space for additional units. This many joints take care of an output of 1000 gallons a day. There are 40 joints of 2-inch pipe in the vapor coils, capable of taking care of an output of 2000 gallons a day. The tower is floored with lath panels every two feet, and boxes and screens are used for distributing the water. The cooler tower complete, without the pipe, cost $1000. It is the plan of the company to build these towers to specifications, all cut and ready to erect, and so put together that they can be moved easily from location to location without loss.

Small Units

The idea which prompted the development of this absorption plant was to get a plant which could be built in small units or large units as the case demands. A unit with a capacity of 50,000 cubic feet of gas can be built for $1500. It is the plan to offer these small units for individual wells, or larger units for bigger gas wells or groups of wells, and to make these small units available also for the recovery of uncondensed still vapors at refining plants.

Carson Resigns As Head Of Carson Petroleum Co.

Chicago, Ill.—E. B. Carson has resigned as president of the Carson Petroleum Company, controlled by Henry L. Doherty & Company, and C. W. Cahoon, formerly vice president and general manager, has been elected to the position.

The following statement has been given out by the management of Carson Petroleum Company:

"At the annual meeting of the board of directors of the Carson Petroleum Company, E. B. Carson, owing to ill health and the necessity of devoting a greater portion of his time to his extensive private interests, tendered his resignation as president of the company. Mr. Carson will continue his activities with the company as a member of the board of directors. C. W. Cahoon, formerly vice president and general manager, has been elected president to succeed Mr. Carson. H. E. Brandli, formerly sales manager, will succeed Mr. Cahoon as vice president and general manager."

Oklahoma City, Okla.—The one cent per gallon tax on gasoline in Oklahoma will become operative on June 30, 1923, according to an announcement by C. C. Childers, state auditor. It is estimated that the levy will increase state tax receipts by approximately $1,000,000.

Okmulgee, Okla.—The Denver producing and Refining Company is constructing a two unit natural gasoline plant in section 31-13-11 west of Okmulgee. The plant will represent an expenditure of about $50,000.

Charcoal Method for Manufacturing Gasoline

New method uses special activated form of cocoanut charcoal for absorption medium

By C. L. Voress, V. C. Canter and R. W. Skoog

The accompanying article was read before the annual meeting of the Natural Gas Association of America at Louisville, Kentucky, during the past month. Details of this latest method of gasoline manufacture are given and the article should prove of interest throughout the industry. —The Editor.

THE natural gasoline industry has been making tremendous forward strides in the past 20 years, and as is the case in every growing industry, new processes, new methods, and new ideas are constantly being produced. Only a few of these survive and become an integral part of the industry. In the natural gasoline industry simple cooling and compression were the first in the field. The oil absorption method followed a few years later to fill a need for a process that would treat a leaner gas. The charcoal absorption process has now been installed by a number of operators, and has been giving such satisfactory results that we have been asked to tell the members of this association something about the process. In doing this, however, we will attempt to confine ourselves as nearly as possible to such terms as are common to the natural gasoline industry, and not use strictly scientific terms and expressions.

The Charcoal Process is known as an absorption process in which the absorption medium is a special activated form of cocoanut charcoal. This charcoal is crushed into pieces of about the size of grains of wheat, each grain of this crarcoal contains countless thousands of microscopic capillaries which have the power of absorbing liquids and gases in various amounts. A good grade of activated charcoal in actual practice will usually absorb from 12 to 18 per cent of its own weight of natural gasoline depending upon the conditions under which the absorption takes place.

A charcoal plant must have a power unit, an absorber unit and a condensing unit.

Power Unit

The power unit for a charcoal gasoline plant is quite simple, consisting usually of a duplicate installation of steam boilers, boiler feed pumps, water circulating pumps and a single lighting outfit. It is common practice in some locations to have the water circulating pumps and small dynamo turbine driven.

The absorbing unit comprises the absorbers filled with activated charcoal and the necessary connections and valves. These absorbers are bult in the form of cylindrical drums either vertical or horizontal. They have metal grating such as subway grating near the bottom covered with a screen upon which the loose charcoal rests. On top of the loose charcoal is a specially designed screen adjusted to move with the expanding and contracting of the charcoal. These absorbers are insulated with any good grade of low pressure insulating material on the outside. Each absorber is directly connected with the valved piping to the inlet gas main, to the vapor line, to the outlet gas main and to the steam inlet main. The valves used on the piping around the absorbers are so arranged, some of them with extended stems where necessary, that they may be operated from a platform constructed between the absorbers. This arrangement is for the convenience of the operators.

The condensing unit comprises three sets of coils and a small tail gas compressor. The object of the first set of coils is to provide means of cooling the vapors coming from the absorbers to a temperature sufficient to assure the condensation of the major portion of water vapor present. The purpose of the second set of coils is to provide for the cooling of the vapors not condensed in the first set of coils to a temperature as near that of the cooling vapor as is practicable.

The major portion of the gasoline produced is condensed at low pressure in these first two sets of condensing coils. The vapors which will not condense at low pressure are raised to a higher pressure by means of a tail gas compressor.

The purpose of the third set of coils is to provide for the cooling of those vapors which come from the small tail gas compressor.

In addition to the equipment already referred to, the necessary run tanks, storage tanks and water supply must be provided. A gas cooler is necessary where the gas is to be turned back into the gas mains.

Operation

The operation of the plant consists in passing the gas containing the rich gasoline vapors to be extracted into direct contact with the charcoal in one of the absorber drums. Immediately upon contact with the activated charcoal the gasoline vapors are caught in the capillaries and retained, the then denuded gas passing on to the point of disposal. The better practice is to have three absorbers so that while one is being saturated with gasoline vapors in the manner just described, a second may be having gasoline vapors removed from the charcoal. The method of removing the vapors from the charcoal consists in passing saturated steam at low pressures, usually from 15 to 25 pounds, in direct contact with the charcoal containing previously absorbed gasoline vapors. The action of the steam causes the gasoline vapors to be removed and carried along to the cooling coils.

The third absorber of the system is necessary in order that one absorber may be cooling while the first is absorbing gasoline vapors from the rich gas, and the second is having the gasoline distilled from the capillaries of the charcoal. The cooling of the charcoal is accomplished by having the treated gas pass through the hot charcoal in the third absorber. This gas enters at a temperature near that of the atmosphere and carries away the heat.

The entire process consists of something more than simple absorption in activated charcoal and a distillation by the use of steam. It comprises a three cycle series of displacements which may be roughly explained as follows: Commencing at the beginning of any cycle, the charcoal in one absorber will be filled to saturation capacity with natural gasoline, a second will be cooled to a point ready to receive a new charge of gasoline, and the third will be hot from the distillation which has just been completed.

In the first step of the cycle saturated steam at about 15 pounds pressure is turned into direct contact with the charcoal saturated with gasoline vapors. The steam on striking cooler charcoal partially condenses, and the gasoline vapors are driven from the capillaries through the vapor lines to the condensers. But condensed water will have taken the place of the gasoline vapors in the capillaries. In other words, the gasoline vapors will have been vaporized from the capillaries of the charcoal and displaced by condensed steam, and at the end of this first cycle the charcoal capillaries will remain filled with water from the condensed steam at the temperature of boiling water, at the pressure carried. The second cycle consists in passing treated gas through this hot water saturated charcoal. This gas contains many lighter vapors such as propanes and butanes which are not condensed to liquid at the gas temperature and atmospheric pressure. The gas temperature is as low or lower than the atmospheric temperature and cooling of the charcoal immediately commences. As the charcoal cools, the capillaries yield their absorbed moisture and absorb in its place the propane and butane from the gas so that at the end of the cycle the charcoal has been cooled to practically the temperature of the flowing gas and has its capillaries filled with vapors lighter than commercial vapors.

The third cycle comprises the contracting of the charcoal filled with lighter vapors with rich untreated gas, so by the process of selective absorption the lighter vapors are gradually displaced by the heavier vapors or commercial gasoline bringing the charcoal back to the point where the first cycle started.

In discussing the charcoal process we do not intend to convey the impression that the design and construction of a charcoal plant is merely a matter of three absorbers filled with so much charcoal connected with a steam plant. Each part must be most carefully considered with due regard to both the

present and future needs. The absorber design must be carefully studied from the standpoint of gas velocity, base surface allowable, depth of charcoal, screen arrangement and capacities for gas volume and gasoline production. The gas is first carefully analyzed for gasoline content and then the absorber designed to meet the conditions of gas flow, gas density, varying gas velocities, heat expansions and latent heat. The charcoal is manufactured by a long and complicated process to meet the specific need to which it is to be put. Before it is placed in the absorbers it is subjected to a most rigid series of laboratory tests to prove its fitness. There are many types and kinds of charcoal on the market at the present time, but only one type will meet the strict specifications demanded by our company. It is a surprising fact that a great many operators in the field have been using a very unsatisfactory grade of charcoal in their small scale testing. These are only a few of the many problems of design and construction that must be most carefully considered. When the plant is once constructed, however, its operation is so simple that it may be entrusted to men with no special or technical training.

When an operator has a gas supply which is not being treated for gasoline extracting, the questions of whether the building of a gasoline plant is desirable or offers an attractive investment naturally suggest themselves to him. Unless he is already a gasoline plant operator and understands the uncertainties and variations in preliminary testing methods, he is at the mercy of any party he may employ to make an investigation. Your committee on standardization is no doubt making a forward step in trying to standardize testing methods for gasoline content. However, the personal element in all small scale testing is so great that a fool proof standard test will not easily be evolved. Various charcoal methods of testing are now widely used. Each of these charcoal methods varies more or less from every other charcoal test method. Considerable risk follows the use of many of these results as a basis for estimation and design of commercial plant construction and operation. The prime requisite of any gasoline recovery testing method is that it shall give an accurate indication of what commercial plant results should be under existing conditions. Any gasoline recovery test should therefore be an honest and carefully studied attempt to duplicate commercial plant conditions as available. Therefore the test must be comparative rather than absolute.

In all of the charcoal plants built or designed by our organization the special charcoal test we have evolved has been used. This test has been improved along with the commercial process and gives a higher test value for gasoline content than any other charcoal testing method examined by us. However, it does not indicate as high gasoline content as the commercial plant will produce.

A comparative test with an existing charcoal plant using the conditions which are to be encountered in the new proposition is the only assurance against the many mistakes in design which may be made if the preliminary testing is not adapted to the conditions and environment under which the plant is to operate.

The production of a charcoal plant and the quality of product produced must conform to the market to be supplied, and therefore the market must be studied as well as the quality of gas being treated. The charcoal with its "selective absorption" and capillaries has the innate qualities which are necessary for sharp cut fractionation. It can be demonstrated that no testing method now in common use will indicate as high content of gasoline of the quality desired to meet the specific marketing conditions as a charcoal plant wil actually produce.

There are several questions which have been asked a number of times concerning the charcoal process. The one question perhaps more often asked than any other is the length of time activated cocoanut shell charcoal can be used without becoming inactive. No charcoal in any plant of ours has become inactive through use, nor have we been able to detect any change in absorptive capacity after long service in a plant. It has been suggested that charcoal would eventually fill up with heavier oil fractions. The charcoal in one plant has been subjected to more than eight thousand distillations and now produces as high yields as were produced three months after the plant was placed in operation. Plants are operating on the tail gas of mineral seal oil absorption plants where considerable mineral seal oil is being carried along with the gas, and on the gas being produced from fields near asphaltic base oil, yet no difficulty has ever been experienced in any of these installations.

The flexibility of operation of a charcoal plant is often questioned. We design every charcoal plant so that, under normal operation, each absorber will be saturated in a two hour period, and the capacity of a plant is designated on this basis. Sufficient cooling surface and reserve capacities are designed in the auxiliary apparatus to handle a considerable overload. If, when the plant starts operation, the production is found to be greater than the calculated production, the operating period may be shortened from two hours to a shorter period so that as much as a 100 per cent increase in production can satisfactorily be had without interfering appreciably with the efficiency of the plant. It is interesting to note in this connection that the last three plants we placed in operation have exceeded the expected production by more than 50 per cent.

Another question often asked is "What is the quality of the gasoline produced by the charcoal plants?" Distillation tests from two operating plants are appended herewith.

The quality of the gasoline produced at any plant must necessarily be governed somewhat by the available market. In some districts it may be advisable to market nothing under a 92 recovery product; in another district it may be good business to market an 88 recovery product. The charcoal process is, as regards distillation, a batch process; that is, a drum of charcoal is saturated in the gasoline and then subjected to steam for distillation. When the heat first penetrates the charcoal, the lighter vapors are expelled, and as the heat is applied for longer periods the distilled product becomes heavier and heavier in gravity. By this method the light, uncondensible vapors never come in contact with the heavier and more stable vapors during the condensation period. This prevents their absorption in the condensed gasoline.

What we have said in the foregoing concerning the recovery of gasoline by the use of charcoal presents such facts as can be covered in a paper of this character and scope, and we hope that this may be instructive to many interested in the charcoal absorption method.

	Sample No. 1	Sample No. 2
Gravity of sample	84	84
Initial point	79	86
5% over	86	94
10% over	92	100
20% over	104	112
30% over	117	120
40% over	130	129
50% over	144	142
60% over	165	158
70% over	184	178
80% over	212	203
90% over	..	252
Final temperature	282	278
Final per cent	89	92
Residue	1%	1.5%
Recovery	90%	93.5%

Western Machinery Company Opens New Office at Tulsa

Tulsa, Okla.—The Western Machinery Company of Los Angeles, California, manufacturers of the "Western" gas engine for oil well pumping, drilling gas, "boosting" gasoline extraction and general power purposes, has opened an office in Tulsa.

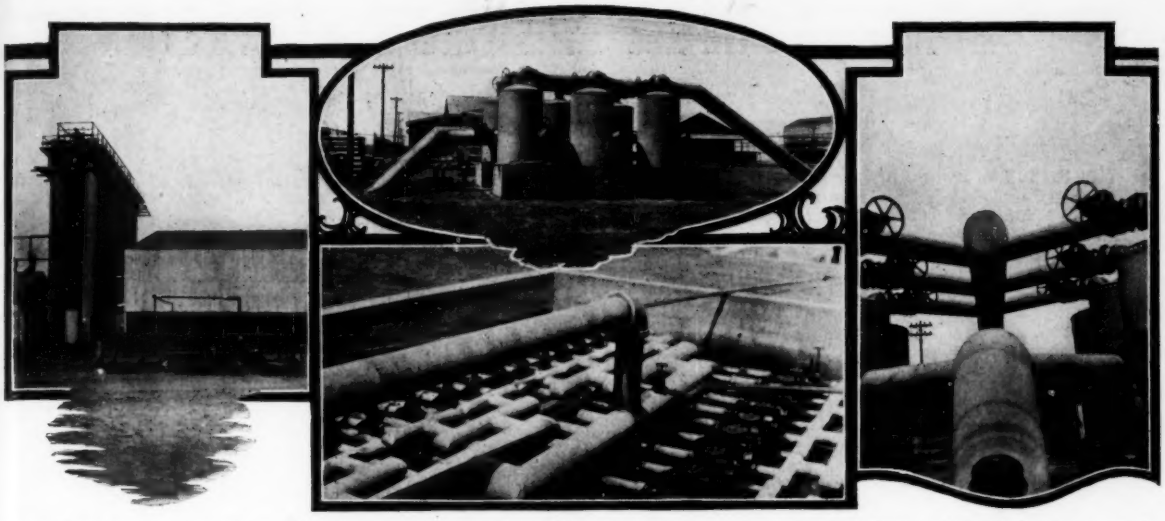
Opening up at Okmulgee some time ago, the Western soon found that it could not keep up the pace with the Mid-Continent demands from this one Oklahoma office. Tulsa called, as it frequently does, and "Western" accepted the invitation.

The new Western Machinery Company's show room and warehouse at Tulsa will be in charge of J. O. Lewis, who was for many years associated with the Worthington Pump and Machinery Corporation, and the Western Supply Company of Tulsa. He is intimately acquainted with the field and knows its requirements in the way of oil well engines.

Chicago, Ill.—Recommendations as to a practical method of converting screw covers into bolted or yoke types on tank cars were formulated at a meeting of the mechanical subcommittee of the general committee on railroad transportation of the American Petroleum Institute held at the Congress Hotel here April 9. The meeting was called by W. R. Boyd, Jr., assistant general secretary of the American Petroleum Institute.

Included among those present were representatives of the mechanical department of oil companies and tank car manufacturers.

Other questions taken up for discussion included: A review of the 1922 report of the Bureau of Explosives with recommendations as to bottom outlet valves and a further consideration of proposals for changes in the interchange rules to be taken up with members of the arbitration committee, or a subcommittee of the American Railway Association.



The De Noya gasoline plant of the Phillips Petroleum Company in Oklahoma, where welding has been used almost universally in pipe connection

Welded Connections for Oklahoma Plants

Method proving popular in Mid-Continent —Phillips' plant is practically all welded

By Grady Triplett

IN the construction of the De Noya natural gasoline plant of the Phillips Petroleum Company, ascetylene welding has been used for every practical pipe connection, both within the plant and for the pipe line system that gathers the gas from the field.

The plant of 20 units, having daily capacity of 30,000,000 cubic feet of gas, is the largest absorption gasoline plant in the Mid-Continent fields. It is in the Burbank field of Osage County, where the company has another plant of similar capacity.

From the time the gas leaves the wells over the Burbank field until it is discharged as dry gas and as natural gasoline, it passes through hundreds of welded connections. Except for such connections as would be convenient for repairs or for dismantling the plant, the welded point has supplanted couplings at every stage of the manufacture of natural gasoline by the Phillips Company.

Tees, ells, straight joints, joints which require angular fittings and reducing joints are welded. Flanges are used with the screw connections, which have been installed to facilitate possible repairs or the necessity of dismantling part of the plant for removal.

The gas is received through a 16 inch line from the field and distributed into a battery of scrubber tanks. With the exception of one ell and flange for each tank, as shown in the accompanying illustration, every connection for each battery of scrubber tanks has been welded.

From the scrubber tanks the gas passes back into a 16 inch line, then into the 20 inch main header, where it is distributed through 10 inch risers and overhead lines into the compressors. One ell with flanges is used on each compressor, with all other joints welded.

Throughout all the process of extracting gasoline from the gas and throughout the process of separating the gasoline from the mineral seal oil, the product passes through non-lead welded joints. Cooling coils, absorbers, stills, heat exchangers and knockout boxes are all welded.

The heat exchanger system for the plant required 11,000 inches of welded connections. The heat exchanger system is so devised that mineral seal oil, after leaving the stills and being cooled, passes through a network of large pipe, inside of which are smaller pipes. As the cooled oil returns to the still in the larger pipes, the hot oil passes through the smaller pipes inside. Thus the double circulating system allows the cool oil to take the heat from the oil just used. This process is continuous.

All welding inside the plant has been under the direction of "Blackie" Crow. While the plant was under construction he had a force of from four to 10 welders under his direction.

As the gas is drawn from the wells, it enters welded separators. These lines are 2 inch. The lines increase in size as they come nearer the plant being 4 inch, 6 inch and on up until the 16 inch main brings the whole volume of gas into the scrubber tanks at the plant. Some 20 miles of lines are necessary for this plant, and all connections for this system are welded.

This field work was done by the firm of Kelly and Dempsey, welding contractors of Bartlesville.

At intervals along the artery drip connections have been provided, according to the contour of the surface. Drip tanks, made of large pipe with ends welded, and 2 inch connections in suitable places are attached below the line. Water and drip gasoline collect in these during the passage of the gas. The drip connections are all welded.

To overcome the problem of contraction and expansion four long Dresser couplings are used for each mile of welded line. These couplings are placed within six joints distance on each side of each corner weld, whether 45 degrees or 90 degrees. These overcome the possibility of damage of corner welds, caused by the maximum strain, which is increased through the shearing action of expansion and contraction, when no provision is made to alleviate it.

All meter connections on the line are welded, including by-pass and regulators.

Baltimore, Md.—The output of gasoline by the Inter-Ocean Oil Company has been increased from less than 4000 barrels to more than 8000 barrels per day, according to Harold F. Brown, sales agent, 1505 Lexington Building, this city. Some time ago this corporation increased its holdings at Wagner's Point by the acquisition of 3.5 acres of land, and installed $300,000 in new machinery. It controls the United States Asphalt and Refining Company, which plant is located on land directly opposite that of the parent concern.

Oklahoma City, Okla.—Two Dubbs process stills will be installed at the refinery of the Texas Pacific Coal and Oil Company which is under construction at Wynnewood, Oklahoma. The plant will handle crude from the Robberson field in southern Oklahoma.

Blending Distillates and Gas Condensates

Discussion records the physical changes occurring when blending process is employed

*By George W. Reid**

The accompanying record has been made by Mr. Reid in his laboratory at the Burkburnett refinery of the Charles F. Noble Oil and Gas Company after a period of several months preparation. The article gives some new slants on the blending of petroleum distillates and natural gas condensates. We would be pleased to receive other discussions on this subject.—The Editor.

AFTER the passing of several months, during which time much work has been performed in the mixing of petroleum distillates for blending purposes, it will be well to record further experiences and conclusions relative to the processes employed and to the degree of success attained. Various questions arising as to preparation and handling of various distillates and the subsequent methods of mixing these fractions should be dealt with. The primary purpose of this recording is, however, to deal with certain physical changes occuring when blending is in process and distillates and condensates are being mixed; to explain these changes—to attempt to expose clearly and adequately the reason and necessity of the seeming loss of some few physical characteristics and properties of component fractions included in blends. The question, in other words, of what nature are the changes in properties whether those constantly recurring changes are purely physical, purely chemical or partly physical and partly chemical.

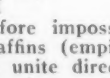
Difficulties will be encountered in attempting to avoid the use of technical wording and phraseology, but where possible the ideas set forth will be recorded employing those terms and expressions most frequently heard "in the trade."

Crude Petroleum—Probably the most fitting definition of crude petroleum is as follows:

Crude petroleum is a complex composition; all varieties are essentially mixtures of liquid hydrocarbons in which gaseous and solid hydrocarbons are dissolved.

(Note—This general definition will be referred to later.)

The definition requires further elucidating comment, therefore the nature of the hydrocarbon molecule will be discussed. In the study of the structure of the individual hydrocarbon molecule of the paraffin series, a condition of absolute saturation is found. Beginning, however, with the atom of carbon it is found that this element, which possesses the power of forming homologous series, is in all cases—quadrivalent—or is a "tetrad"—meaning that when combined with hydrogen, four atoms of hydrogen must enter into the combination to satisfy the valence (combining power) of each carbon atom present. Inasmuch as the carbon atom is quadrivalent and the entire group (all individual members thereof) of paraffins indicate by their formuli and structural constitution that the series is saturated, i. e. the four bonds of carbon must be and are united to four separate hydrogen atoms (graphically thus:



It is therefore impossible for the group of paraffins (empirical formula CnH2nx2) to unite directly with another CH_4 group, or, in fact, with any other saturated group.

The term paraffin is derivitive of the Latin words parum affinis, because the paraffins are of little affinity or are extremely resistant to all chemical reagents. The group, or members thereof, can unite chemically in no way save substitution, meaning that no member of the series can unite with any other member of the series nor become chemically active with any of the different members. By substitution of some foreign atom for one hydrogen atom the hydrocarbon may be utilized in other chemical compounds, loosing, however, its identity as a hydrocarbon entirely, viz., CH_4 plus Cl_2 equals CH_3Cl plus HCl, or; methane plus chlorine gives methyl chloride plus hydrochloric acid (gas). This reaction occurs when equal volumes of CH_4 and Cl_2 are exposed to diffused sun light—and holds true generally with three of the halogens, chlorine, bromine and iodin.

The preceding discussion is for the purpose of emphatically indicating that the members of the paraffin series are in no way chemically active with one another whether extracted from natural gas or from crude petroleum and furthermore to prove conclusively that in blending of petroleum distillates the changes in physical properties occurring are in no way resultant of chemical activity.

Mixture—Referring to the definition of crude petroleum it is found that crude oil is a mixture of liquid hydrocarbons, etc. A second and more edifying definition classes crude petroleum as a mixture of a homologous (homogenetic) series, the numerous members of which series are miscible with or soluble in each other.

This truism is born out and augmented by the simple expedient of crude oil fractional distillation in refining in that the members of the series represented in crude petroleum are fractionated by distillation (a physical method of separation) and the fractions collected as distinctly different products. These fractions in turn, upon distillation are refractionated, or separated into still other dissimilar products, in so far as physical properties are concerned. Continued close separation in no way affects the empirical chemical formuli of the members involved so long as pyrogenic (cracking) conditions (temperature and pressure) are not employed.

Fractional Distillation

Considering the fractional distillation of crude again it is found that the first fraction yielded by distilling possesses a lower initial boiling point than the original oil. This more volatile distillate will in turn yield a portion of still lighter distillate and again evidencing an appreciably lower boiling point—a greater vapor pressure.

The same phenomena is perceived in experimenting with natural gas condensates, proving conclusively the foregoing statement in which the terms mixture and solution are used fully describing the composition of the compounds from which gasoline distillates are derived.

Solution Pertaining to Blending

Solution may likewise be termed a mixture in certain cases and especially where liquids are involved. A mechanical mixture, for differentiation, is essentially a collection of substances, either elements or compounds, which retain their original chemical identity and which may be separated by physical methods. In this work the method of separation or "un-mixing" is fractional distillation. Solutions, therefore, of petroleum distillates are merely and purely mechanical mixtures.

On the other hand, a chemical compound would be composed of elements or compounds so combined that each has lost its original identity and whose properties have been definitely changed—either with an evolution or absorption of heat. This new substance can be separated in no manner save by chemical action—that is toward the restoration of any of the original substances involved in the reaction and combination.

Putting it differently, in solutions or mixtures of petroleum distillates there is no change within the moleclue. In preparing solutions of distillates and condensates, one with the other or others, the molecular attraction called cohesion peculiar to each component is overcome. The molecules of each component merely move aside, so to speak, to allow molecules of the solute room or space enough, making for intimacy of contact. The invading solute is given room or space for its peculiar molecules to mix and mingle with those molecular particles of the solvent liquid.

Upon completion of the solution or mixing the force of cohesion is still in effect, but this time the force or attraction is that of the solution as a distinct and different substance—not chemically different, but physically differing—i. e., specific gravity, boiling point, color, etc. This line of reasoning is meant to cover the phenomena evidenced when solutions are prepared of liquids composed chemically of members of homologous series.

Speeding Solution

Solution may be speeded by the weakening of the cohesion peculiar to a

*Chief Chemist Chas. F. Noble Oil and Gas Company.

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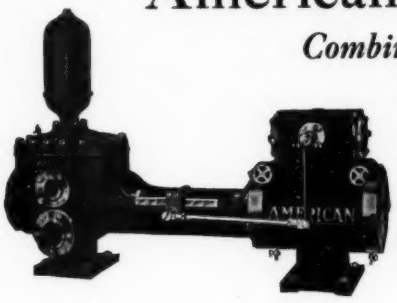

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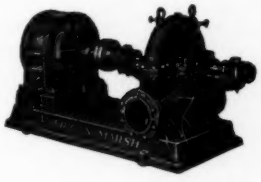

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substance. This weakening generally is accomplished by application of heat. The force is weakest with substances in the gaseous state and stronger in the liquid state and strongest, of course, with solid matter. Work in mixing petroleum distillates and natural gas condensates, however, must proceed in using liquids because of the commercial impracticability of vaporizing the various components.

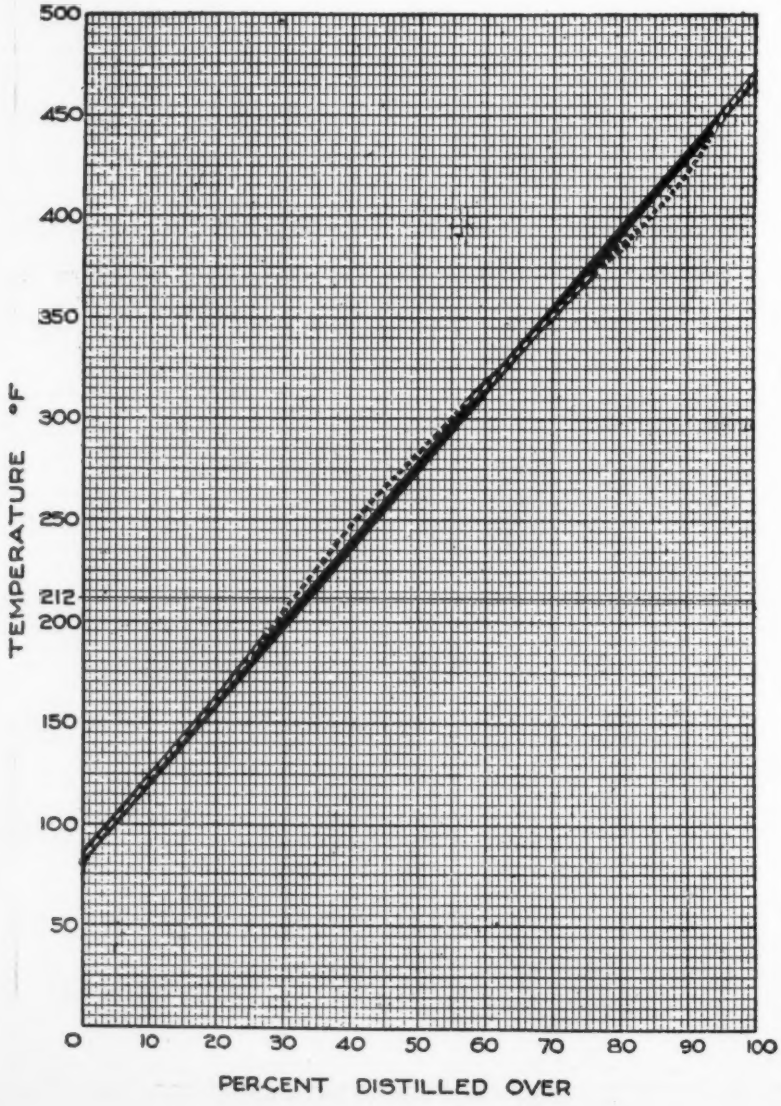
The original physical properties of solute and solvent disappear upon solution. Further description of solution would define it as a homogeneous mixture of substances forming a single PHAZE—gases are all mutually soluble in all proportions, liquids dissolve gases, other liquids and solids. This molecular intermixing is accompanied by the evolution or absorption of heat —termed as either heat of dilution or of solution. This phenomena is evidenced in mixing petroleum distillates and natural gas condensates; though the general indication is merely an equalization of temperature due to differences in temperature of natural gasoline (very cold) as compared to the temperature of refined products. (Temperatures, of course, vary with weather conditions.)

Solution of the type prepared as "blends" can be termed as "singular solutions" in so far as the vapor pressure curve shows a maximum or minimum, indicating the formation of a constant boiling point mixture. In elucidation of the foregoing statement the law of Wuellner is cited, i. e., the lowering of the vapor pressure of a solvent is approximately proportional to the quantity of solute dissolved in it if the quantity of the solute be very small. Applying this law if it found that the boiling point of solutions of hydrocarbon fractions are influenced directly by the concentrations (volume) or dilution. Within certain limits the boiling point of natural gasoline will be raised by certain mixtures of fractions. Any increase in volume or percentage of natural gasoline will then tend to depress the boiling point. The law of Bladgens is given to augment and confirm this conclusive fact, i. e.: "The depression of the freezing point or increase in boiling point of a solution is for small concentrations proportional to the amount of dissolved substance." For further augmentation it will be well to cite the law of Le Chatelier namely "If a system in physical or chemical equilibrium be subjected to a stress involving a change of temperature, pressure, concentration or similar stress, the state of the system will automatically tend to alter so as to minimize (or undo) the effect of the stress."

The raising of boiling points is further explained by the fact that solution of heavier fractions with light condensates invariably lowers the vapor pressure (law of Wuellner above) of the system and so raises the boiling point of the light condensate. In dilute solution the effect is proportional to the molecular ratio between solvent and solute, but deviations occur with concentration.

The lowering of temperature reading of maximum temperature (known as end point) upon distilling blends or mixtures is not due to any chemical action or combination, but due entirely to the mechanics of the new or different cohesive force acquired by the liquid upon solution—the solution being the blended product.

The foregoing explains the physical nature of the changes evidenced and identified when petroleum distillates undergo admixture with natural gas condensates.



Blending

In the preparation of blends of petroleum distillates and natural gasoline there are many factors influencing the properties of the resultant product; all of these various influencing circumstances are, however, entirely of a physical nature. Fortunately for the "blender" no changes of a chemical nature can possibly enter into the procedure under conditions prevalent where such distillates are mixed. Pyrogenic conditions are, of course, not present. In following the path of the group of paraffin hydrocarbons present in gasoline from its origin in the bowels of the earth, through the exposure to refining methods, excepting pyrolysis, through blending, transportation and retail dispensation, to its ultimate consumption by the internal combustion engine; the one and only change of a chemical nature occurring is manifested in, or as, combustion products—resulting from explosion of gasoline in its vapor state well mixed with air. Such chemical change results in the formation of carbon dioxide, carbon monoxide, methane and free oxygen, hydrogen and nitrogen.

In view of the facts set forth in this writing in opposition to the theroy of chemical activity and reactions occurring during mixture of blends, and which idea (and the word idea has been well weighed before use) has been proven untrue and more or less possessing qualities of hallucination and delusion, the discussion, then, of blending motor fuels, sans chemical reactions, follows.

There are in use at present two general policies followed in the mechanical preparation of blended motor fuels, viz., the practice of arranging formuli to cover requirements of each day's work or each order received for the department of sales, necessitating adjustment of percentages of components in accordance with volume of stocks in storage and the employment of tank cars as blending tanks. Methods of this type obviate the possibility of acquiring the essential property of uni-

Congealing Temperatures of Cracked Residue

Cold test of crude or fuel of great importance —Residue has a greater value when cracked

By Jacque C. Morrell and Gustav Egloff

THE cold test or congealing temperature of petroleum oil, be it heavy crude or fuel oil, is of great economic importance. Heavy crude oils predominate in point of production from such fields as California, Texas and Mexico; and much difficulty is found in their transportation during cold weather on account of their high congealing temperature. Fuel oils from the distillation of lighter crude petroleum are also somewhat difficult to transfer and for the same reason. Heavy crude oil to be transported in pipe lines or tank cars must be heated by fire or steam during cold weather or cut back with distillate oil to lower the cold test or congealing temperature of the oil. Fuel oil from the topping of crude or the residuum therefrom must be heated during cold snaps so that the oil does not solidify during transportation from the tank car to the storage tank, the latter also requiring steam coils to allow industrial flow movement of the oil.

Now it has been found that when heavy oils, such as crude or residuum therefrom, are subjected to heat and pressure in the production of gasoline, the residuum resulting therefrom has a much lower congealing temperature than the oil before being processed and requires no heating for transportation or use purposes.

It is suggested that heavy crude and fuel oils be cracked into gasoline and a residuum product much more useful for fuel purposes than the starting oil to be processed.

It is criminally wasteful to burn heavy hydrocarbon oil industrially.

Heavy hydrocarbon oils such as crude petroleum or fuel should be con-

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formity and tend to confusion of results and their recording for reference purposes. The effect is demoralizing to systematic control and manufacture, and products of quality are rendered difficult to attain. This method, if followed, is probably the crudest type of blending procedure employed.

The second policy or practice of blending is corrective of the evils and vagaries of the first. By employing systematic preparation of distillates according to previously determined specifications and admixing components in accordance with formuli of proven value as to quality and resultant characteristics; mixing definite predetermined proportions, the important quality of invariable uniformity is absolutely assured.

Adoption of this latter method of blend preparation necessitates accurate scientific refining of distillates. If quality is to be assured and preserved chemical and physical control must be employed throughout all stages of the refining processes. Uniform quality can not be maintained unless each portion or percentage is prepared today with the same boiling range and specific gravity, etc., that will be present on all other days.

It will be well to state here in this connection that blends may be assured of standardization more easily and conveniently if blended in three to five car lots in especially erected and constructed blending tanks and entirely independent of refinery, loading rack and compression plant. This policy with independent or co-operative supervision would certainly be more heartily indorsed by the chemical department.

The subject of "two way" blending has been treated in a previous writing and formula given covering many combinations.

Law of Wuellner

Elsewhere in this report the law of Wuellner has been cited, viz.: "The lowering of the vapor pressure of a solvent is approximately proportional to the quantity of solute dissolved in it if the quantity of solute be very small." Upon close observation it has been ascertained that this law holds true with fair constancy in the mixing of distillates as blends. The amount or percentage of casinghead usable in "two way" blends is indeed limited. For general purposes the accepted limit at present is approximately 15 per cent solution of casinghead gasoline for maximum efficiency in the usual type of motor gasoline. By experiment and actual test in internal combustion engines it is indicated that 12 to 15 per cent blended with the usual straight run of 58 to 60 gravity results in a product of greater acceleration and more mileage possibilities. Therefore in the matter of blending two way types no policy could be indorsed wherein results were desirable other than a few degrees rise in gravity (called lightening up) and a slight lowering of initial boiling point. In no instance must a distillate be mixed with natural gasoline when those two components are extremely different in physical and chemical characteristics or properties.

In their efforts to obtain as much salable gasoline from crude oil as possible the refiner today generally obtains a naphtha, low in gravity, but of reasonably low end point; 450 to 460 degrees F. This material is then utilized in blends.

The "navy" cut, the low gravity "naphtha" and natural gasoline are then the three essentials of the blended product. Occasionally, where necessity requires it, some small proportion of the "aviation" cut is employed to secure a uniform product. The three essential fractions mentioned above, however, are generally sufficient for the preparation of blended products which can be produced with remarkable uniformity and meeting practically any specifications as to gravity, initial boiling point and end point. The problem is reduced to one of mere proportional mixing.

Consideration must of course be given to the gravity of each component employed as well as the I. B. P. and E. P. of the various solution of fractions. Weather conditions (humidity and temperature) influence the boiling points to some extent; especially the lighter fractions employed. Exposure to conditions hastening or retarding evaporation affect the boiling point of the resultant mix.

The nearest perfect type of motor fuel which can be produced is possibly that blend which upon distillation gives the "straight line curve." This opinion is confirmed by the Bureau of Mines unofficially. This curve indicates positive uniformity of product in that there is a uniform volume or percentage distilled for each degree rise in temperature—or its boiling range is uniform, its curve is neither concave downward nor upward but is diagonally straight.

However, when the type of blend which has hitherto been termed as the "straight line blend" is required the processes and methods of preparation become more exacting. Percentages of components are of course influenced by gravity and other specifications. Formuli are not arbitrarily chosen and can not be definitely determined unless unquestionable uniformity of all fractions employed can be absolutely maintained. The problem here reverts itself to one of chemical control of plant operation.

The distillates and condensates employed in blending should be as similar in all characteristics as possible to those components which will be used in the days to follow—this because of the variation of members of the paraffin hydrocarbon group constituting distillates which were derived from the original crude under different methods, also because the constituent members of the series are present in varying amounts at different stages of refining.

The chemical constitution of compression condensate (liquifaction of paraffin hydrocarbon by compression and condensation) varies with the pounds pressure employed in their compression and subsequent condensation. This statement indicates that different proportions of the members of the paraffin series are collected in the condensates as gasoline when varying pressures are employed. (Alliteration must be pardoned—used for sake of emphasis.)

This line of reasoning forcibly signifies the imperative and important nature of the chemical control feature now embodied in efficient refining organizations in that the proper scientific preparation of petroleum distillates of absolute uniform characteristics (both physical and chemical properties) must be untiringly aimed for. Given distillates and condensates of dependable quality, and given interdepartmental co-operation and co-ordination effort, and little difficulty will be experienced in producing blended motor fuels of excellent quality and unquestionable uniformity.

Note—The entire dissertation could be presented in a few concise statements—alliteration and redundancy have been used freely for emphasis.

verted into at least 35 per cent gasoline by cracking. The residue from this cracking is a fuel oil of greater economic importance than the oil it was derived from, on account of its much lower congealing temperature.

Thousands of barrels of heavy hydrocarbon oils of 14 to 28 Baume gravity have been actually commercially cracked into 35 per cent or more of gasoline; hence it is an economic waste to burn heavy oils when by simple heat and pressure they can be converted into gasoline and residual fuel of greater social importance than the oil processed.

In testing of petroleum products such as fuel oils and lubricating oils the cold or congealing test is very important. In a good many cases, especially where the fuel oil is to be used in geographic regions which have very cold seasons, the usefulness of a fuel oil with a high cold test may be seriously curtailed. It is known that cracked residua have low viscosities relative to their gravities as compared with those of fuel oil. The relatively low congealing temperatures of cracked residua, however, have not been pointed out.

It is the purpose of this paper to compare and point out the congealing temperatures of such craked residua with those of the fuel oils from which they are produced. It is further the purpose of this paper to chart the physical constants of cracking residua, along with their calorific values, laying particular stress on the congealing temperature. As examples, various charging stocks with the cracked residua therefrom have been analyzed and described.

The cold or congealing tests of heavy hydrocarbon oils or of any oil correspond in a general manner to the melting or fusion points of substances in general. More specically this physical constant is comparable to the fusing point or congealing point of pitches, resins and other substances which have no definite melting point, when considered in the light of this physical constant as applied to crytalline solids. Even more they resemble super-cooled liquids, such as glasses. In this respect the transition from the solid to the liquid state or from the liquid to the solid state is gradual and indefinite. This same transition in the case of crystalline solids is sharp and definite; hence, experimentally we can not determine this so-called physical constant in the case of fuel oils with the same degree of precision as in the case of crystalline solids. Further the transition is not noticeably accompanied by an absorption or giving out of heat; i. e., the cooling curve does not show a break. In all systems there is the possibility of super-cooling; for example, when pure water is cooled down below its freezing point in a clean vessel, separation of ice does not take place sharply at zero.

However, on further cooling crystallization sets in, and the temperature rises rapidly to zero with steady progress of freezing. In some cases where the under-cooling in systems is considerable and the mass loses heat to its environment, the latent heat may be insufficient to increase the temperature to the true freezing point and low results will be obtained. In a heterogeneous equilibrium, such as a transformation of a solid into a liquid at constant temperature, if equilibrium is not established with very great rapidity, heat loss can not be compensated by the heat of crystallization.

In general it may be said that a new phase will not necessarily be formed immediately when the system passes into such a condition that the existence of that phase is possible. To insure the formation of a new phase it is necessary to have that phase present. This is usually initiated by having a nucleus of the same substance in the solid state or of an isomorphous solid phase. Usually in cases of this kind the liquid substance is first allowed to super-cool somewhat and is then seeded.

When the viscosity of a liquid is high, undercooling may take place to a considerable extent. Some organic substances usually crystalline become viscous when undercooled and on reaching room temperature again take on a glassy appearance and structure, which may be preserved for long periods without crystallization occurring. Ordinary glasses which are composed chiefly of silicates, on undercooling become so viscous that on returning to normal temperatures they entirely fail to cystallize. This phenomenon is valuable in glass. When devitrification or crystallization takes place under certain circumstances, the glass becomes useless for most of its purposes. In nature we have igneous rocks such as obsidian, approaching in composition the average composition of granites. Obsidian is, however, formed from a super-cooled magma and is glassy in appearance as contrasted with granites. Hydrocarbons of the gasoline type when cooled to solidification show a glassy non-crystalline structure; however, pure individual hydrocarbons of the paraffin series such as methane, ethane, etc., indicate crystalline structure. Yet, it must be recognized that gasoline, kerosene, gas oil, fuel and heavy crude oils, are complex mixtures containing not alone hydrocarbons, but sulphur, nitrogen and oxygen derivatives which prevent crystallization of pure compounds therefrom. The melting points or fusing points of organic compounds in analytical work represent usually a criterion of the purity of substances and although not usually determined with a very great degree of accuracy, are sufficient to reveal the effects of chemical constitution.

Experimental Method

The apparatus used in the following experiments consisted of a glass jar to contain the freezing or cooling mixture. This jar was insulated with heavy felt. A smaller jar about one and a quarter inches in diameter and five inches high was used as a container for the oil to be tested. The freezing mixture was agitated by means of a glass rod looped at the lower end, the loop being parallel to the bottom of the jar.

The thermometer used for temperatures above —25° F. was the mercury thermometer, as per A. S. T. M. specification, namely, 22.2 centimeters long, scaled for 4½ inches, immersion from —35° to 120° F.

For temperature below —20° a toluene thermometer scaled from —100°C. to +30°C. was made use of. In all experiments for the temperature range between —10° F. and —5° F. the toluene thermometer was checked against the mercury thermometer. For temperatures down to 0° F. various mixtures of crushed ice and sodium chloride, or crushed ice and calcium chloride were used. For temperatures below 0° F. various mixtures of solid carbon dioxide and ether were used. The congealing point was taken as the temperature at which the oil had completely passed from the liquid to the solid state, that is, when the test jar could be held in a horizontal position for five seconds without appreciable movement of the oil around the thermometer. From one inch to one and a quarter inches of oil was used in the test jar. All readings were checked and the average of several determinations taken as the congealing temperature. It may be noted that congealing of the oil in the test jar takes place from the wall of the jar inward toward the thermometer, so that the portion of the liquid in direct contact with the thermometer is the last to congeal and the temperature at this moment is therefore the true congealing point. In order to avoid false equilibria the more viscous residua were allowed to stand at room temperature for a day or so before making the test.

It is to be specifically pointed out that the cold test or congealing temperature is not only a function of the temperature recorded on the thermometer at the time the oil congeals, but also of the rate of cooling.

The method followed in obtaining these temperatures is the usual arbitrary one of using a cooling medium much lower in temperature than the point at which congealing actually takes place. This brings in also the factor of the rate of heat removal, i.e., the thermal conductivity of the system.

If we imagine the oil to be divided up into concentric layers it will be found that the temperatures of the various concentric shells will decrease from the temperature of the bath or cooling medium to that of the congealing temperature as recorded.

Calorific Values

The heat values of the various cracked residua and fuel oils shown in the table were determined by means of the Parr calorimeter. The values reported are corrected for radiation, acids and fuse wire.

The petroleum oils used in this investigation resulted from cracking in the Dubbs process. The charging stocks and residual oils were analyzed as to distillation, gravity, flash, fire, viscosity, heat units, coke and carbon tests, and congealing temperature. The results of these analyses are shown in tables following.

CUSHING GAS OIL

	Gas Oil Cold Test +40°F.	Cracked Residuum Cold Test —18°F.
Gravity		
Baume Gravity at 60°F.....	34.4	26.6
Specific Gravity at 60°F. ..	0.853	0.895
Cleveland Open Cup—Flash and Fire		
Flash . .....185°F.		220°F.
Fire . .....220°F.		260°F.
Viscosity Saybolt Universal (Seconds)	Secs.	Secs.
100°F.	46.4	57
Coking Test (A. S. T. M.)		
Per cent	0.2%	3.5%
Conradson Carbon Residue		
Per cent .....Trace Carbon		2.6%
100 cc. Engler Distillation		
Init. B. P.	358°F.	407°F.

Percent Over	Temp. °F.	Temp. °F.
5	452	485
10	487	511
15	507	537
20	523	544
25	537	557
30	552	568
35	563	585
40	576	596
45	588	604
50	601	616
55	613	630
60	627	644
65	642	658
70	657	675
75	677	698
80	700	719
85	727	777
90	772	767
95	760	787
96.5	...	800
99	710	...

MID-CONTINENT GAS OIL

	Gas Oil Cold Test	Cracked Residuum Cold Test
	+29°F.	—36°F.
Gravity		
Baume Gravity at 60°F.	35.4	24.0
Specific Gravity at 60°F.	0.8478	0.9100
Cleveland Open Cup—Flash and Fire		
Flash	265°F.	190°F.
Fire	265°F.	260°F.
Viscosity Saybolt Universal (Seconds)	Secs.	Secs.
100°F.	43	60
Coking Test (A. S. T. M.)		
Per cent	Trace Coke	5.9%
Conradson Carbon Residue		
Per cent	Trace Carbon	3.5%
100 cc. Engler Distillation		
Init. B. P.	426°F.	320°F.

Percent Over	Temp. °F.	Temp. °F.
5	481	490
10	502	523
15	513	538
20	524	549
25	536	563
30	544	575
35	550	584
40	557	596
45	566	605
50	573	615
55	583	626
60	592	640
65	600	657
70	614	673
75	626	695
80	645	727
85	665	742
90	687	756
94	...	760
95	750	...
98	758	...

CALIFORNIA GAS OIL

	Gas Oil Cold Test	Cracked Residuum Cold Test
	—70°F.	—35°F.
Gravity		
Baume Gravity at 60°F.	27.6	9.5
Specific Gravity at 60°F.	0.8896	1.003
Cleveland Open Cup—Flash and Fire		
Flash	175°F.	211°F.
Fire	200°F.	255°F.
Viscosity Saybolt Universal (Seconds)	Secs.	Secs.
100°F.	41.5	111
Coking Test (A. S. T. M.)		
Per cent	Trace Coke	14%
Conradson Carbon Residue		
Per cent	Trace Carbon	9.9%
100 cc. Engler Distillation		
Init. B. P.	368°F.	380°F.

Percent Over	Temp. °F.	Temp. °F.
5	470	520
10	449	543
15	466	563
20	481	577
25	499	593
30	512	613
35	522	627
40	533	646
45	550	660
50	562	675
55	574	692
60	586	713
65	600	730
70	617	738
75	638	740
80	657	745
85	679	Superheated
90	738	...
95	764	...
97	748	...

MEXICAN GAS OIL

	Gas Oil Cold Test	Residuum Cracked Cold Test
	—40°F.	—45°F.
Gravity		
Baume Gravity at 60°F.	26.2	17.4
Specific Gravity at 60°F.	0.8973	0.9503
Cleveland Open Cup—Flash and Fire		
Flash	210°F.	190°F.
Fire	240°F.	270°F.
Viscosity Saybolt Universal (Seconds)	Secs.	Secs.
100°F.	50	66
Coking Test (A. S. T. M.)		
Per cent	1% Coke	5.3%
Conradson Carbon Residue		
Per cent	Trace Carbons	4.1%
100 cc. Engler Distillation		
I. B. P.	295°F.	382°F.

Percent Over	Temp. °F.	Temp. °F.
5	450	487
10	485	510
15	501	524
20	515	545
25	527	557
30	542	569
35	555	580
40	565	595
45	580	605
50	595	620
55	609	638
60	625	655
65	647	680
70	662	695
75	679	720
80	701	741
85	720	760
90	725	...
94.5	...	775
95	705	...
99	600	...

MID-CONTINENT FUEL OIL

	Fuel Oil Cold Test	Cracked Residuum Cold Test
	+56°F.	— 2°F.
Gravity		
Baume Gravity at 60°F.	26.9	20.6
Specific Gravity at 60°F.	0.8933	4.930
Cleveland Open Cup—Flash and Fire		
Flash	230°F.	210°F.
Fire	275°F.	295°F.
Viscosity Saybolt Universal (Seconds)	Secs.	Secs.
100°F.	181	205
Coking Test (A. S. T. M.)		
Percent	3.2%	9.1%
Conradson Carbon Residue		
Percent	3.05%	7.72%
100 cc. Engler Distillation		
Init. B. P.	443°F.	366°F.

Percent Over	Temp. °F.	Temp. °F.
5	512	530
10	539	571
15	573	602
20	600	618
25	624	626
30	650	638
35	675	664
40	685	684
45	715	693
50	702	707
55	725	713
60	721	716
65	730	730
70	735	750
75	738	756
80	727	757
85	713	760
90	665	700
91	...	609
96	760	...

BURKBURNETT FUEL OIL

	Fuel Oil Cold Test	Cracked Residuum Cold Test
	+63°F.	—4°F.
Gravity		
Baume Gravity at 60°F.	21.7	21.2
Specific Gravity at 60°F.	0.9176	0.9267
Cleveland Open Cup—Flash and Fire		
Flash	280°F.	215°F.
Fire	335°F.	275°F.
Viscosity Saybolt Universal (Seconds)	Secs.	Secs.
100°F.	347.5	144
Coking Test (A. S. T. M.)		
Percent	5.3%	9.7%
Conradson Carbon Residue		
Percent	4.56%	6.7%
100 cc. Engler Distillation		
Init. B. P.	498°F.	330°F.

Percent Over	Temp. °F.	Temp. °F.
5	577	505
10	593	545
15	625	656
20	645	595
25	670	620
30	682	645
35	690	665
40	700	685
45	701	704
50	710	724
55	726	737
60	726	740
65	722	743
70	707	695
75	703	665
80	687	693
85	660	745
89.8	...	Superheated
90	765	...
95	Superheated	...

LOUISIANA FUEL OIL

	Fuel Oil Cold Test	Cracked Residuum Cold Test
	+36°F.	—20°F.
Gravity		
Baume Gravity at 60°F.	14.0	4.0
Specific Gravity at 60°F.	0.972	1.028

	Fuel Oil Cold Test +36°F.	Cracked Residuum Cold Test —20°F.
Cleveland Open Cup—Flash and Fire		
Flash	180°F.	191°F.
Fire	242°F.	232°F.
Viscosity Saybolt Universal (Seconds)		
	Secs.	Secs.
100°F.	10,257.6	122.9
Coking Test (A. S. T. M.)		
Percent	14.7%	17.28%
Conradson Carbon Residue		
Percent	14.1%	14.8%
100 cc. Engler Distillation		
Init. B. P.	340°F.	220°F.
Percent Over	Temp. °F.	Temp. °F.
5	405	370
10	503	445
15	570	490
20	590	515
25	649	530
30	670	550
35	688	567
40	698	590
45	701	615
50	665	645
55	620	675
60	638	708
65	688	740
70	709	748
75	690	560
80	708	...
82.5 (dry)	...	565
86 (dry)	736	...

LOUISIANA TOPPED CRUDE

	Crude Oil Cold Test +66°F.	Cracked Residuum Cold Test —18°F.
Gravity		
Baume Gravity at 60°F.	28.6	22.0
Specific Gravity at 60°F.	0.8827	0.9211
Cleveland Open Cup—Flash and Fire		
Flash	220°F.	170°F.
Fire	280°F.	240°F.
Viscosity Saybolt Universal (Seconds)		
	Secs.	Secs.
100°F.	144.2	110
Coking Test (A. S. T. M.)		
Percent	3.83%	9.66%
Conradson Carbon Residue		
Percent	2.846%	5.98%
100 cc. Engler Distillation		
I. B. P.	418°F.	354°F.
Percent Over	Temp. °F.	Temp. °F.
5	506	500
10	551	535
15	576	562
20	600	580
25	623	607
30	640	623
35	656	640
40	675	667
45	700	690
50	717	704
55	723	725
60	722	745
65	699	754
70	714	763
75	720	767
80	716	769
85	700	650
90	696	620
90.5	...	580
96	725	...

LOUISIANA FUEL OIL

	Fuel Oil Cold Test +43°F.	Cracked Residuum Cold Test —13°F.
Gravity		
Baume Gravity at 60°F.	27.0	22.5
Specific Gravity at 60°F.	...	0.918
Cleveland Open Cup—Flash and Fire		
Flash	240°F.	190°F.
Fire	310°F.	260°F.
Viscosity Saybolt Universal (Seconds)		
	Secs.	Secs.
100°F.	257	141.5
Coking Test (A. S. T. M.)		
Percent	3.8%	6.8%
Conradson Carbon Residue		
Percent	3.562	6.32%
100 cc. Engler Distillation		
Init. B. P.	405°F.	340°F.
Percent Over	Temp. °F.	Temp. °F.
5	550	495
10	573	434
15	608	560
20	625	584
25	645	610
30	668	647
35	691	658
40	720	690
45	727	715
50	725	731
55	745	748
60	756	762
65	760	766
70	758	776
75	750	791
80	740	800
85	690	800
90	640	...
95	Superheated	...

It will be noted from table 1 that the cracked residua from fuel oils of various origin shows congealing points vary from 56° F. to 67° F. lower than the parent charging stocks. Comparison of the viscosities of the cracked residua with those of the fuel oils from which they are produced will show for the Mid-Continent fuel oil and the residuum therefrom that they are of the same order. However, for the Texas and Louisiana fuel oil the viscosities are considerably less for the residuum. It may be noted that the Louisiana fuel oil with a Be. Gr. of 14° and a viscosity of over 10,000 seconds produced a residuum of a Be. Gr. of 4° with the remarkable drop in viscosity to 123 seconds. It will be further noted that with the exception of the California gas oil the viscosities of the cracked residua from the gas oil charging stocks are of the same order as those of the oils. The congealing temperatures are much lower, carying from 5° F. to 58° F. These cracked residua possess remarkable properties with respect to their use as fuel, especially under climatic conditions which would render the charging stocks from which they are made difficult to use.

It may be interesting to speculate upon the difference in congealing point of the gas oils from the Mid-Continent field and that of Mexican and California oils. It is well known that the composition of these various types of oils is markedly different. It may also be possible that the same factor which affects the congealing temperature of the California and Mexican gas oils, likewise affects the congealing temperature of the residua. Except in a comparison of the residuum from the Mid-Continent fuel oil and that from the Burkburnett fuel oil, there seems to be no relationship between the congealing temperature and the gravities of either the charging stocks or the residua produced therefrom. In general there does not seem to be any definite relationship between the viscosities of the residua and their congealing temperatures.

Rellstab[1] found that for liquids of the same homologous series the time of flow decreases with every additional CH_2 group, that is, the viscosity in-

[1]Dissertation Bonn, 1868.

(Continued on page 33.)

TABLE NO. 1

Oil—	Be. Gr.	Sp. Gr.	Cold Test	Viscosity Universal Saybolt (100°F.) Secs.	Calorific Values Corrected Cal. per GM.	B. T. U. per Lb.	B. T. U. per Gal.
Cushing Gas Oil	34.4	0.8524	+40°F.	46.4			
Cracked Residuum from Cushing Gas Oil	26.6	0.8944	—18°F.	57.0	10840	19510	145,470
Mid-Continent Gas Oil	35.4	0.8478	+19°F.	43			
Cracked Residuum from Mid-Continent Gas Oil	24.0	0.9100	—36°F.	60	10488	18880	143,130
California Gas Oil	27.6	0.8894	—70°F.	41.5			
Cracked Residuum from California Gas Oil	9.5	1.007	—35°F.	111	10110	18620	155,660
Mexican Gas Oil	26.2	0.8973	—49°F.	50			
Cracked Residuum from Mexican Gas Oil	17.4	0.9503	—45°F.	66	10350	18640	147,570
Mid-Continent Fuel Oil	27.0	0.8927	+56°F.	181	11047	19857	147,670
Cracked Residuum from Mid-Continent Gas Oil	20.6	0.9303	— 2°F.	205	10695	19251	149,190
Burkburnett Fuel Oil	23.2	0.9147	+63°F.	347.5	10635	19143	145,870
Cracked Residuum from Burkburnett Fuel Oil	21.2	0.9267	— 4°F.	144	10656	19181	148,080
Louisiana Fuel Oil (A)	14.0	0.972	+36°F.	10.257	10175	18314	148,380
Cracked Residuum from Louisiana Fuel Oil (A)	4.0	1.028	—20°F.	122.9	10080	18144	157,850
Louisiana Fuel Oil (B)	27.0	0.8917	+43°F.	257	10870	19566	145,530
Cracked Residuum from Louisiana Fuel Oil (B)	22.5	0.918	—13°F.	141.5	10417	18750	143,530
Louisiana Topped Crude	28.6	0.8827	+63°F.	144.2	10872	19570	144,090
Cracked Residuum from Louisiana Topped Crude	22.0	0.9211	—18°F.	110	10717	19290	148,140

Start Your *Own* File *NOW!*

The Refiner and Natural Gasoline Manufacturer has, during the eight months of its life, already printed a number of articles of real interest and value to refiners and natural gasoline men.

If you have not started your **own** file,

FILL OUT THE COUPON BELOW

It is the purpose of its publishers to present to its readers articles each month on subjects of current interest, and technical articles appealing to refiners and natural gasoline plant men. Its articles are **not** written by reporters, or newspaper men, but by experienced refinery men who, appreciating the value of a technical journal for refiners, are writing from their own observations and experiences.

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The REFINER and NATURAL GASOLINE MANUFACTURER
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Gentlemen: Pleased find enclosed one dollar (check or currency will do) for which send me The REFINER for one year.

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Street and No. .....

City .....

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Executive
Superintendent.
Please check above.

Moore Again Chosen President of Refiners

(Continued from Page 8)

An arrangement where perhaps two or three great marketing concerns could be formed, operating cotemporaneously in all the great centers where our products are marketed at this time, with thoroughly organized departments in charge of experienced men capable of handling efficiently all of the various products we manufacture? * * *

"Let us suppose, what seems to me to be an entirely reasonable supposition, that there is a brokerage firm who agrees with us that a different plan is possible and desirable. That brokerage firm comes before the industry and makes the following proposition:

"First—We will undertake to show you that our organization consists of a group of men who have proved, by their past record and business history, that they are men worthy of the respect and trust of those whose business affairs we are to undertake to handle.

"Second—That in addition to character and trustworthiness they are men of experience in the lines of business we are undertaking to handle and that there are numbered among them men who are capable, because of such experience, of handling any line of goods you may offer.

"Third—That we are so organized and our officers and departments so distributed that we can efficiently cover all the territory into which you desire to move your products, and when evidence is presented to us, or if such evidence is discovered through our own activities, that there is territory not worked which is favorable territory for the handling of your goods, we will at once undertake to cover that territory by placing representatives within it capable of giving it the attention necessary to develop it.

"Fourth—We are prepared to submit evidence that we are so financed that we can carry out any financial obligations we undertake.

"Fifth—We will undertake, through our representatives in the various fields, to furnish you from time to time, carefully compiled information as to the condition of the industry in the various sections covered, the volume of business moving currently as compared with previous periods, the volume of business being handled by the interests we represent as compared with the total volume of business being handled as nearly as such information can be compiled from the various sources available. We will obtain as far as possible information as to prices quoted for competing goods from fields and will truthfully represent the quality of such goods as compared with goods being furnished by us, this information to be furnished regularly and at such intervals as shall be agreed upon between us.

"Sixth—We will undertake to determine, by frequent conferences with leaders in the refining industry, to be appointed by you for the purpose, the actual conditions existing in the refining and marketing departments of the industry the costs of production based upon the established price of crude oil, and the fair price which should be obtained for your various products when considered in the light of the ruling prices prevailing in the retail market and will be guided by your advice and counsel in all matters affecting the welfare of the industry.

"Seventh—We will permit an examination of our books and records by a committee of refiners or by public accountants who will be permitted to furnish to you any information of a general character which concerns our methods of handling business matters affecting your interests, or of any matters concerning the business of any particular firm when such firm consents to and requests such information be given.

Results

"Let us now suppose that the heretofore impossible was accomplished and that such a proposition had been made to us and accepted by the refining industry, the brokers presented to the refiners as approved brokerage concerns and a determination made to give the matter a fair trial, what would be some of the effects immediately apparent?

"First—The possibility of providing relief in movement of goods through such a concern for any particular individual who needed such relief on account of congested conditions, because of the wide field they covered, without disturbing marketing conditions.

"Second—The handling of off grade stuff at reduced prices made necessary by such off grade condition, without such reduced price being used as a bear influence on other products, their sale being handled by the broker without misrepresentation and with perfect understanding on the part of everyone, just as a single refiner will himself dispose of off grade products at times without affecting his regular range of prices. One of our serious problems is the untruthful representation that prices made on account of adjustments or failure to meet specifications are prices being quoted for regular grades of goods.

"Third—The furnishing of reliable information at short intervals, regarding demand and consumption in all fields, on which could be based, if we cared to exercise reasonable intelligence in the handling of our business, our plans for adjustment of runs to marketing conditions or of providing storage and future excessive demands, the substitution of reasonable certainty for uncertainty, of intelligence for lack of intelligence in the conduct of our affairs.

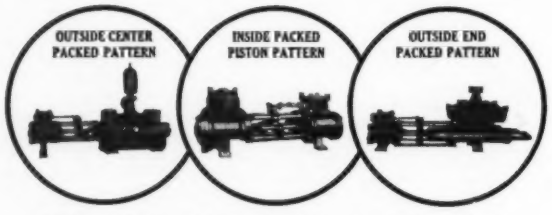
"Fourth—Representation, at convenient points for the adjustment of disputes regarding shipments, outages, specifications and such other matters as are dependent upon physical examination for intelligent handling.

"Fifth—The possibility of determining at once and conclusively the responsibility for bad practices or business methods which are detrimental to the best interests of the refining industry and threaten its stability and prosperity."

A short while back we received an inquiry asking the patent numbers on certain cracking processes mentioned in articles in The REFINER and Natural Gasoline Manufacturer. We are pleased to advise that the Connerty-Bruin process is covered by patents No. 1,283,202, dated October 29,1918, issued to E. H. Johnson and W. Snodgrass, and that the Fenchelle and Perkins process is covered by British patent No. 6547, dated March 14, 1914.

Wichita Falls, Texas, April 23.—The work of rebuilding the Griswold Oil Corporation's 2500 barrels daily capacity skimming plant, which has been moved from Henrietta to Electra is nearing completion, and the owners plan to have the refinery in operation about the middle of May. This plant was acquired by Griswold last summer from the Beacon Refining Company, and was moved to save pipe line charges on crude produced by the company in the South Electra field.

DURABLE DUPLEX STEAM PUMPS



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DEAN BROS. CO. INDIANAPOLIS.

PERSONNEL OF THE INDUSTRY

Directing officials of the Standard Oil Company (Indiana) have completed a tour of the Middle Western and Southwestern sales territory. The inspection party was headed by Col. Robert W. Stewart, chairman of the board, and included W. E. Warwick, Beaumont Parks, Allan Jackson, E. G. Seubert, E. J. Bullock, T. J. Thompson and R. H. McElroy. W. M. Burton, president of the company, did not complete the tour, he having left the party at Quincy, Ill., and returned to Chicago. The officials made the trip in a special car and visited Quincy and Peoria, Illinois; Kansas City, Wichita, Davenport, Iowa, and Des Moines, Iowa, as well as other points. While in Kansas City the party made a side trip to the company's refinery at Sugar Creek, Mo.

Sam Hunt, general manager of J. D. Street and Company, St. Louis, Mo., attended the Western Petroleum Refiners Association meet at Galveston. Sam expressed his regrets for not being able to stay for the "bathing girls review."

Richard T. Wallace has recently been made traffic manager of the Chicago office of the Marland Refining Company.

Earl W. Sinclair, president of the Sinclair Consolidated Oil Corporation, was a visitor in Tulsa during the past month.

J. R. Trolinger, for the past three years in the sales department of the Empire Refineries, Inc., at Tulsa, has been transferred to the Chicago office of that company.

A. M. Johnston, vice president and general manager of the Petroleum Iron Works in the southwestern district, returned to his headquarters in Houston after several weeks spent in the fields of Louisiana and Arkansas.

E. R. Redgrove, chief chemist of the Vacuum Oil Company, Ltd., of London, has resigned his position to become connected with Snowden Sons and Company, Ltd., at Millwall, England.

B. B. Williams, president, and F. H. Thomas, vice president, of the C. & G. Cooper Company, manufacturers of gas engines and compressors, have returned to the company's offices in Mt. Vernon, Ohio, after an extended tour of the oil country, which included a visit to Tulsa and Casper, Wyoming.

ROY B. JONES
President of the Panhandle Refining Company, with headquarters at Dallas, Texas

E. E. Harrington, traffic manager of the National Refining Company, spent a few days in the Tulsa office of his company during the early part of the month.

N. L. DeBlond, formerly branch manager for the Midland Refining Company at Cleveland, has resigned his position and is moving to Kansas City, his old home.

A party of Standard officials, including Robert W. Stewart, Allen Jackson, E. G. Saubert, R. H. McElroy, E. J. Bullock and T. L. Thompson, have returned to their Chicago headquarters after a tour of the southwest.

W. L. Kistler, president of the Producers and Refiners Corporation and elected second vice president of the Western Petroleum Refiners Association at the Galveston meeting, paid a brief business trip to the Tulsa offices of his company last month.

J. J. Keim, president of the Keim Construction Company, announced the arrival of a fine baby boy at his house early this month. The new arrival is also the grandson of Charles Farquarhson, president of the Pioneer Tank and Boiler Company of Tulsa.

John T. White, who is well known in the Northwest, where he was connected with the C. L. Maguire Petroleum Company, is in charge of the St. Paul, Minn., office of Barnsdall Refining Company which has recently been opened in that city.

A. H. Mulliken was added to the board of directors of the General American Tank Car Corporation at the company's annual meeting here in April, succeeding C. H. Doyle. Other directors were re-elected.

Joseph Edwards, manager of the Beacon Refining Company, which was recently merged with the Griswold Oil Corporation and its skimming plant moved from Henrietta to Electra, Texas, has resigned to devote his time to looking after some acreage owned in the vicinity of a wildcat producer in North Texas.

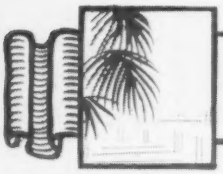
Retiring directors of the Union Tank Car Company were re-elected and officers were subsequently re-elected at the company's annual meeting in April. At a special meeting stockholders of the company approved the director's resolution providing for the issue, purchase and sale of common stock for trustees on behalf of employes. Directors estimate that not more than 10,000 shares will be required to carry out this plan and these will be provided out of 70,000 shares of common which have been authorized but have not been issued.

J. H. Miller, president of Miller Petroleum Company, and O. H. Williams, president of the Mutual Oil Company, headed the party of Kansas City refiners who attended the Galveston convention.

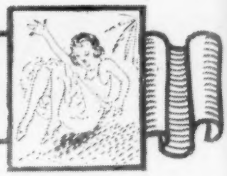
R. T. Musser, representative of the General American Tank Car Corporation, with headquarters at Dallas, Texas, made a tour of inspection among refining centers in the Rocky Mountain sections during the past month.

Dr. C. K. Francis, vice president of the Producers and Refiners Corporation, is away from his Tulsa offices on a business trip to Chicago and New York. He recently returned from Parco, Wyoming, where he spent some time completing plans for increasing the capacity of his concern's plant.

The Tulsa delegation to the Western Petroleum Refiners Association convention at Galveston, April 10-12, included E. R. Perry and D. W. Moffit of Cosden & Company, C. L. Mayhall, S. C. Scivally of Union Petroleum, P. M. Miskell of the Empire Refineries, L. N. Oppenheimer of Sapulpa Refining Company, A. V. Bourque, secretary of the Association of Natural Gasoline Manufacturers and others.



NOT SO REFINED



To Be Continued

John Long had 14 children, and they had all been rocked in the same cradle. One evening as Mrs. Long was rocking the fourteenth child, she said to her husband with a wan smile:

"John, this cradle is pretty near wore out."

"Yep," said John, "it's about used up." Then he handed Mrs. Long a $10 bill and added: "Next time ye go to town, mother, git a new one—one that'll last."—Los Angeles Times.

Wanted

Salesman with automobile for Texas. Prefer man who has had experience selling valves and fittings to Oil Refineries. Salary and commission. Give references. Box 100, care Gulf Publishing Co.

Electrically Driven Centrifuges
Hand Centrifuges
WRITE
WILLIAMS, BROWN & EARLE, Inc.
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918 Chestnut St. Philadelphia, Pa.

She Said It

"I'm going over to comfort Mrs. Brown," said Mrs. Jackson to her daughter, Mary; "Mr. Brown hung himself in the attic a few days ago."

"Oh, mother, don't go. You always say the wrong thing."

"Yes, I'm going, Mary; I'll just talk about the weather. That's a safe enough subject."

Mrs. Jackson went over on her visit of condolence.

"We've had rainy weather lately, haven't we, Mrs. Brown," she said.

"Yes," replied the widow, "I haven't been able to get the week's washing dried."

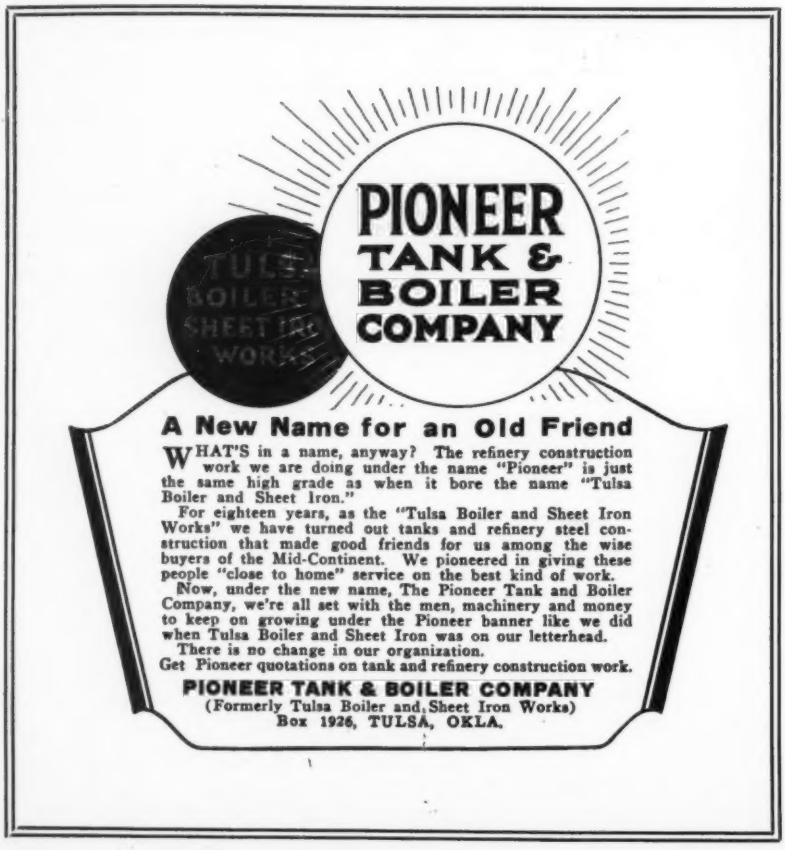
"Oh," said Mrs. Jackson, "I should not think you would have any trouble. You have such a nice little attic to hang things in."—Midwest Review.

All Wrong

"Johnny," said the teacher, "if coal is selling at $14 a ton and you pay the dealer $65, how many tons will he bring you?"

"A little over three tons, ma'am," said Johnny promptly.

"Why, Johnny, that's not right," said the teacher. "No ma'am, I know it ain't right," said Johnny, "but they all do it."—Judge.



A New Name for an Old Friend

WHAT'S in a name, anyway? The refinery construction work we are doing under the name "Pioneer" is just the same high grade as when it bore the name "Tulsa Boiler and Sheet Iron."

For eighteen years, as the "Tulsa Boiler and Sheet Iron Works" we have turned out tanks and refinery steel construction that made good friends for us among the wise buyers of the Mid-Continent. We pioneered in giving these people "close to home" service on the best kind of work.

Now, under the new name, The Pioneer Tank and Boiler Company, we're all set with the men, machinery and money to keep on growing under the Pioneer banner like we did when Tulsa Boiler and Sheet Iron was on our letterhead.

There is no change in our organization.

Get Pioneer quotations on tank and refinery construction work.

PIONEER TANK & BOILER COMPANY
(Formerly Tulsa Boiler and Sheet Iron Works)
Box 1926, TULSA, OKLA.

His Lucky Day

Country Editor (out West)—"This has been a lucky day for me."

Faithful Wife—"Has someone been in to pay a subscription?"

Editor—"Well, no it wasn't so lucky as that; but I was shot at and missed."

Correct

College Professor to Student—"By what means is electricity transmitted?"

Student—"Why-er—"

College Professor — "Correct, and how measured?"

Student—"What?"

College Professor—"One hundred per cent."—Brooklyn Standard Union.

It Smoked

"How long does an engine last?" asked the inquisitive old lady of the locomotive engineer.

"About 30 years," he answered patiently.

"Oh, I should think a tough looking thing like that would last much longer than 30 years."

"Maybe it would, ma'am," he replied, "if it didn't smoke so much."—Good Hardware.

Typographically Speaking

Speaking of typographical errors, which like the poor, are always with us, reminds us of a newspaper report of a wedding. The statement was made that "The roses were punk." In a later edition an apology was offered and was followed by the statement, "What we meant to say was, 'The noses were pink'."

It was the dear old lady's first ride in a taxi, and she watched with growing alarm the driver continually putting his hand outside the car as a signal to following traffic. At last she became exasperated.

"Young man," she said, "you look after that car of yourn and watch where you are going. I'll tell you when it starts raining."—Hurry Back News.

"No, sah, Ah don't never ride on dem things," said an old colored woman looking in on the merry-go-round. "Why, de other day I seen dat Rastus Johnson git on an ride a dollah's worth an' den git off at the same place he started at. I says to him, 'Rastus,' I says, 'yo' spent yo' money, but whar yo' been?' "

Anybody Would

"I beg your pardon," said the girl timidly, "would you care to help The Working Girls' Home?"

"Sure thing," said the State Street ornament briskly, "where are they?"

One of the many Oklahoma plants of the gasoline department of the Gypsy Oil Company near Kiefer, Oklahoma —Photo—Clarence Jack, Tulsa

Natural Gasoline Men Primed for Tulsa Meet

Second annual convention of association will have representatives from all gasoline sections

Tulsa, Oklahoma—Natural gasoline manufacturers of the United States will gather here April 24 for the second annual convention of the Association of Natural Gasoline Manufacturers. A program of three days has been prepared. Two days will be devoted to business and professional matters, with a banquet the second night. The third day will be given over to a visit to gasoline plants in Osage County, Oklahoma, followed by a visit to the experiment station of the Bureau of Mines at Bartlesville, Oklahoma.

Replies to the scores of invitations sent from the office of A. V. Bourque, secretary of the association, indicate that every section of the United States, having the natural gasoline industry, will be represented. Preparations are being made to accommodate several hundred visitors.

The program will bring messages from authorities in the various phases of the manufacture of natural gasoline. It has been so arranged that the several gasoline producing districts of the country will be represented by speakers. The committee on arranging the program has gone outside the gasoline industry by arranging addresses by men prominent in other phases of the petroleum industry.

All sessions of the convention will be held in the auditorium of the Tulsa high school. The banquet, which promises to be the highlight of the three days gathering, will be in the banquet room of the Tulsa hotel.

An address that promises to carry special interest is that by J. A. Rafferty, general manager of the Carbide and Carbon Chemicals Company of New York. He will speak on "Natural Gasoline Production Methods," his remarks to be illustrated. He is a close student of the natural gasoline industry and is considered an authority on the various processes of extracting gasoline from gas.

Colonel George A. Burrell, co-inventor of the charcoal process of gasoline extraction with G. G. Oberfell, will discuss the charcoal process the second day of the convention. This new method has aroused considerable interest recently and this talk is sure to carry intense interest to those attending the convention.

Colonel Burrell was in charge of research work for the army and navy on gas masks, gas bombs and shell, incendiary bombs, smoke screens and other similar topics during the world war. He received the distinguished service medal for his services. While with the United States Bureau of Mines he published many bulletins on the gasoline industry.

THE PROGRAM

Tuesday, April 24

Address of Welcome—D. E. Buchanan, Sales Manager of the Chestnut & Smith Corporation, Tulsa, Oklahoma.

Annual Address—W. M. Welch, president of the association, Tulsa, Oklahoma.

"Development of the Natural Gasoline Industry in Wyoming"—Dr. C. K. Francis, chief chemist of the Producers and Refiners Corporation, Tulsa, Oklahoma.

"Development of the Natural Gasoline Industry on the Pacific Coast"—R. E. Beckley, general superintendent of the Pacific Gasoline Company, Los Angeles, California.

"Natural Gasoline Production Methods"—(illustrated) J. A. Rafferty, general manager of the Carbide and Carbon Chemicals Company, New York.

Night Session

"The Oil Investigation"—An address by R. L. Welch, general secretary of the American Petroleum Institute, New York.

Wednesday, April 25

Business session of the association, election of officials and other routine matters of the organization.

"The Charcoal Process"—Colonel George A. Burrell, Pittsburgh, Penna.

"Safe Transportation of Gasoline"—By Colonel B. W. Dunn, chief inspector of the Bureau of Explosives, New York.

Night

Annual Banquet at Hotel Tulsa, D. E. Buchanan, toastmaster.

"The Oil Fraternity"—C. C. Herndon, vice president of the Skelly Oil Company, Tulsa.

Thursday, April 26

Automobile trip to the gasoline plants of the Phillips Petroleum Company and the Skelly Oil Company in the Burbank pool of Osage County and a visit to the experiment station of the United States Bureau of Mines at Bartlesville, Oklahoma.

Cross-Widdell Refinery Engineering Co. Formed

Kansas City, Mo.—The Cross-Widdell Engineering Company has recently been organized here to do a consulting refinery engineering work and to act also as plant constructors.

The new concern is composed of Doctors Roy and Walter Cross, well known Kansas City petroleum chemists, and H. E. Widdell, who has been in the consulting and refinery construction business for a number of years.

Among the plants which Mr. Widdell built are the Mutual at Chanute, the Sapulpa Refining Company at Sapulpa, and the Interocean Refining Company at McCook, Illinois.

Bureau of Mines Testing California Lube Values

Washington, D. C.—Dynamometer tests on California lubricating oils for internal combustion engines, now being conducted by the Department of Interior, at the San Francisco laboratories of the Bureau of Mines, are not intended for a comparison of Califronia lubricating oils with those of other fields. Misunderstanding in regard to this has arisen from the fact that acidity and emulsification tests for class C oils as designated by the interdepartmental petroleum specifications committee and published in Bureau of Mines technical paper 305, are said to have resulted in uniust discrimination against certain California oils. The claim is made that some California oils which do not pass the tests have been found entirely suitable for international combustion engines.

The experimental work now being performed by the interior department, in co-operation with the American Petroleum Insitute, should determine the efficiency of California oils which do not pass the acidity and emulsification specifications by comparing them, through the medium of dynamometer tests, with California oils similar in general character, but which meet the acidity and emulsification requirements.

RECENT REFINERY PATENTS ISSUED

BY STAFF REPRESENTATIVE

Washington, D. C.—The following patents of interest to the oil refining industry have recently been issued by the patent office at Washington:

Treatment for Shale

No. 1,447,296, on an apparatus for the combined solvent and destructive distillation treatment of shale, issued on March 6 to David T. Day, of Washington, D. C. The patent comprises an apparatus for extracting hydrocarbon oil material from oil bearing shales which apparatus comprises retort means for distilling shale, a treatment chamber capable of holding a bath of oil and having an opening for the introduction of fresh shale, a shale discharge opening for the discharge of treated shale, a discharge opening for the aeriform material produced, and an opening for the discharge of extracted oil material, means for removing shale from said chamber and passing it to said shale discharge opening, and a pipe directly connecting said chamber and said retort for conducting directly into said chamber material distilled from shale in said retort.

To Treat Various Materials

No. 1,447,297, issued on March 6 to David T. Day, of Washington, D. C. The patent covers the process of obtaining hydrocarbon oil material from oil bearing earthy material which process consists of subjecting the earthy material to be treated to immersion in a bath of liquid oil in a container, separating the earthy material from said bath of oil, subjecting all of said earthy material so separated to heat treatment to drive off substantially all volatizable material therefrom, and passing the material thus driven off into the container of said bath of oil and utilizing the hydrocarbon material so driven off as the material of said bath of liquid oil.

Desulpherizing Hydrocarbon Oils

No. 1,448,644, issued on March 13 to Peter Von Ditmar, of Germany, on a method for treating hydrocarbons and particularly petroleum, being a method for desulpherizing hydrocarbon oils containing sulphur, comprising heating the hydrocarbon oils with a metallic soap of the higher fatty acids in a closed vessel whereby liberated fatty acids can be drawn off when a layer of them has been formed, and adding a small percentage of metallic sodium while the chemical reaction is taking place.

To Make New Product

No. 1,448,709, a patent on the art of oil distillation, issued on March 13 to John E. Schulze, of Chicago, assignor to Red River Refining Company, Inc., Shreveport, La. The patent comprises as a new article of manufacture, a mineral lubricating oil having a viscosity of at least 150 seconds Saybolt universal (at 100 degrees F.), and further characterized by the fact that when a sample of said oil is substantially completely distilled under an absolute pressure of 5 mm. mercury or less and under non-oxidizing conditions, the first 10 per cent fraction and the last 10 per cent fraction of the distillate differ in viscosity by not more than 700 seconds Saybolt universal (at 100 degrees F.).

As a new article of manufacture, a straight overhead lubricating oil distillate derived from a naphthenic base oil and having a viscosity of not less than 90 seconds Saybolt universal (at 212 degrees F.), said distillate being substantially free of tarry matter.

The process of producing useful mineral oil distillates which comprises distilling, under an absolute pressure not exceeding 25 millimeters mercury, mineral oil material containing substantially no constituents as volatile as gasoline.

Method for Making Lube

No. 1,448,084, a patent on a method of producing lubricating oils issued on March 13 to Thomas F. Ott, Berkeley, Calif. The patent covers the process of decolorizing oils, which consists in mixing acid with an oil by a number of increments, adding water to each oil and acid mixture after more than one of the acid increments, removing acid sludge after each acid increment, then washing with an alkali after removal of the acid sludge resulting from the final acid increment.

Distilling Hydrocarbons

No. 1,448,254, issued on March 13 to William M. Burton, of Chicago, and Edgar M. Clark, Alton, Ill., assignors to Standard Oil Company, Whiting, Ind. The patent comprises the process of distilling petroleum hydrocarbons, which consists in heating a liquid body of such hydrocarbons above its atmospheric boiling point under a pressure of upwards of four atmospheres to effect distillation thereof, and feeding into such liquid body from an extraneous source a fresh stock of hydrocarbon having a boiling point under the prevailing pressure lower than the temperature of the liquid body, thereby superheating and cracking the infed material.

Cracking Hydrocarbons

No. 1,449,226, a patent on a process of cracking hydrocarbon oils under pressure to produce a low boiling-point fraction from a higher boiling-point oil or fraction, issued on March 20 to Richard W. Hanna, William D. Mason, and Walter G. Hamilton, assignors to Standard Oil Company, San Francisco, Calif., a corporation of California. The patent is a continuous cracking process consisting in primarily heating a moving body of petroleum oil having a material range of boiling points to a temperature above the boiling point of a fraction or fractions thereof while subjecting the same to a pressure sufficient to maintain the same in substantially liquid form, in which primary heating the oil is brought approximately to the active cracking reaction temperature of the higher boiling fractions of the oil, a material portion of the heat necessary to raise the oil to such temperature being supplied by heating means independent of the heating means of the cracking system proper, then passing such heated liquid into a cracking system, which includes a heating zone, vaporizing chamber and condenser maintained under pressure, whereby the primarily heated oil is subjected to a higher temperature, the oil flowing through the heating zone being subjected in said heating zone to only such a degree of

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AND

JOSEPH V. MEIGS

Research and Consulting Chemist

Member Amer. Chem. Soc.; Amer. Assoc. for the Advancement of Science; Soc. of Chem. Industry; Societe de Chimie Industrielle; Franklin Institute; New Jersey Chem. Soc.

Contains a complete description of practically every process of making gasoline and other motor fuels of promise or prominence. The theoretical and practical considerations have been carefully weighed, and in this book the PRACTICAL OPERATOR will find many suggestions of value for the improvement of his plant.

The converting of low-grade petroleum residues into gasoline by the cracking method has called for inventive effort of the most marked ingenuity, and more than twenty chapters are devoted to the description of cracking processes, as these will undoubtedly be foremost in the ways and means of producing motor fuel for many years to come. The book describes the methods of obtaining gasoline from natural gas and casinghead naphtha as well as from shale oil.

CHAPTER HEADINGS

Mixed Fuels.
The Testing of Motor Fuels.
Gasoline Refinery Practice.
Refining Methods, Sulphur Removal, Chemical Treatment, Distillation.
Forwood's Processes.
Distillation Under Pressure.
Cracking in Stills Under Pressure
Redwood and Dewar Process
Burton Process
Coast's Processes.
Cracking Heavy Oils in the Liquid State.
Tube and Retort Cracking in the Vapor Phase.
Hall's Processes and Methods.
Cracking in the Vapor State—Rittman Process.
The use of steam in Decomposing Heavy Oils to yield Naphtha and Gasoline.
Cracking in the Presence of Hydrogen, Hydro-carbon and Other Gases.
Chemical Methods of Cracking Oils.
Cracking and Distilling by Means of Fused Baths and Indirect Heating Means.
Cracking With the Aid of Internal Heat.
Cracking by Electrical Methods.
The Condensation of Hydrocarbons from Gases.
Benzol, Use as Motor Fuel and Manufacture.
Alcohol as Motor Fuel.
Shale as Source of Motor Fuel.
The Pyrogenetic Treatment of Asphalt.
Appendix—Statistics on Petroleum Products.

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heat as will furnish the heat of reaction and offset heat losses from radiation, vaporization and reflux condensation, thereby through the medium of the aforesaid primary heating avoiding the exposure of any portion of the oil to excessive local temperatures and resultant excessive cracking and carbon deposit in any portion of the heating zone of the craking system, and then passing the oil so heated in said heating zone to the evaporating chamber of the cracking system.

No. 1,449,227, a patent on a process of cracking hydrocarbon oils under pressure, issued on March 20 to Richard W. Hanna, William D. Mason, and Walter G. Hamilton, assignors to Standard Oil Company, San Francisco, Calif., a Corporation of California. The patent covers in a cyclic process of cracking petroleum oil in a closed circulating system under a substantially constant cracking temperature and pressure, both of which are substantially uniform throughout the cracking system, including a heating zone and evaporating chamber, maintaining a relatively large body of oil in the evaporating chamber and circulating a relatively small stream thereof to and through the heating zone and back into said chamber, to produce a substantially uniform cracking reaction in said chamber during the entire run and to substantially confine the cracking reaction to the evaporating chamber, by forcibly circulating the oil from the evaporating chamber to and through the heating zone and back to the evaporating chamber at such a relation of speed and volume of circulation as to maintain such circulation equal to passing such entire body of oil through the heating zone at intervals of not substantially more than ten minutes, and maintaining, during the entire run, all portions of such oil at so nearly the same temperature that the temperature of the oil at its exit from the heating zone is less than 15 degrees F. above the temperature of the oil in said chamber, whereby such constant temperature and pressure is maintained throughout the system.

No. 1,449,313, a patent on a distilling apparatus issued on March 20 to Hermann Bollmann, of Hamburg, Germany. The patent covers in a distilling apparatus the combination of a closed evaporator structure having a boiler and a head, of vertical partitions, subdividing the lower portion of the boiler into a plurality of compartments, such compartments being in vapor free communication with each other at their tops, pipes connecting the bottom of each of said compartments with the next succeeding compartment, whereby the liquid is delivered from the lower part of one compartment into the upper part of the next compartment of the series, such pipes being of substantial smaller cross section than such compartments and being free from heating coils therein, and of means for separately heating the liquid in the successive compartments to successively higher temperatures.

Treating Hydrocarbons

No. 1,449,452, issued on March 27 to Horace B. Setzler, Coffeyville, Kansas, assignor to the National Refining Company, Cleveland, Ohio, a Corporation of Ohio. The patent covers, in an apparatus for treating hydrocarbons, the combination with a pressure still, of a two-limbed condensing apparatus connected directly above the still and discharging from one of its limbs into the same and from the other limb into cooling coils, supply coils positioned within said limbs and a supply line connecting with said coils for furnishing hydrocarbons through the condensing apparatus to said still, whereby the effective temperatures in both limbs may be approximately maintained and waste of heat may be avoided, substantially as set forth.

New Refining Method

No. 1,499,731, issued on March 27 to Ulysses F. Clemons, of Marshall, Okla., assignor of one-half to Charles F. O'Neall, Dallas, Texas. The patent covers an apparatus for refining crude petroleum and hydrocarbon oils, including a tank, heating means for the tank arranged there below, foraminous supporting means in and extending throughout the entire area of the tank arranged above the bottom in the vapor space thereof, a bed of fuller's earth of substantial depth arranged on said supporting means for retarding, filtering, absorbing and climinating extraneous matter from the petroleum vapors, a condenser, a connection between the tank and condenser and an automatic valve in said connection and being located between the tank and the condenser for operation upon a predetermined pressure of vapor being reached in the tank.

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REFINERY AND GASOLINE PLANT ACTIVITIES

Less Crude Charged to Stills During March—9,000 Barrels Below February

Tulsa, Okla.—A material reduction in the amount of crude run to stills is indicated in a resume of refinery operations in the Mid-Continent as of April 1, just made by one of the larger refining interests in the field. Total runs during March averaged 271,500 barrels daily, which does not include oil run by Standard Oil companies. This is some 9000 barrels below the daily average for February in this field.

Contributing causes for the reduction are the continued unsatisfactory condition of the refined market and the fact that stocks of finished oils in the Mid-Continent have reached a high point which does not permit further accumulations at present prices for high grade crude of good gasoline content.

Kansas refiners were taking approximately 53,000 barrels of crude on April 1 as compared to around 60,000 barrels on March 1. This oil was being handled at 24 independent plants in the state, which were in operation on April 1 with 17 plants shut down at that time. The Standard Oil Company (Kansas) refinery at Neodesha was running in the neighborhood of 8500 barrels on April 1, which was a slight reduction from the amount being run through stills the month previous.

Oklahoma refineries were taking some 141,200 barrels on April 1 with 55 plants in the state operating on that date and 65 shut down. Refiners' crude takings in Oklahoma showed a decided drop during March as the total runs on April 1 were almost 30,000 barrels a day under the total on March 1, which was 169,400 barrels daily. Some of the largest refineries in the state contributed to this reduction as operations were being cut down to more nearly conform with the refined oil demand.

On April 1 34 plants in North Texas were taking approximately 53,500 barrels, which was some 7000 barrels a day below the daily average for the month previous, the February average for the section being 60,400 barrels. Thirty-eight plants in North Texas were shut down on April 1, but two of these plants have started up again since that date and now are running between 4000 and 5000 barrels a day, which will increase the total daily average for the state during April.

North Louisiana and Arkansas refiners did not vary so much in operations during March as compared to activity in February. Plants in the former state on April 1 were taking around 15,100 barrels a day and those in the latter state were running in the neighborhood of 8600 barrels daily. This oil was being taken by five refineries which were in operation in North Louisiana in March and by 10 refineries which were running in Arkansas during the month. There were 11 plants shut down on April 1 in North Louisiana and seven were inactive in Arkansas.

MID-CONTINENT REFINERY OPERATIONS

As of April 1, 1923

	Total Plants	No. Running	No. Shut Down	Crude Runs (bbls.)
Kansas	41	24	17	53,100
Oklahoma	120	55	65	141,200
North Tex.	72	34	38	53,500
North La.	16	5	11	15,100
Arkansas	17	10	7	8,600
Totals	266	128	138	271,500

Late market reports from the Middle West and Northwest and portions of the upper Southwest indicate that an improvement is under way in the gasoline demand and if such turns out to be the case operations at refineries in the Mid-Continent likely will be speeded up during April with the result that more crude will be needed and some of the plants now idle will be started up again to meet these requirements for the spring motoring season.

Wichita, Kan.—Sterling Oil and Refining Company of this city has completed the purchase of 100 new tank cars from the Pennsylvania Tank Car Company and 75 additional tank cars have been leased to handle the company's increased business in refined oils. The new cars purchased by the Sterling have a capacity of 8000 gallons and represent an investment of approximately $210,000.

Texhoma Installs Dubbs Process at Wichita Falls

Wichita Falls, Texas.—Installation now being made of four units of the Dubbs cracking process at the Texhoma Oil and Refining Company's 4000 barrels daily capacity skimming plant north of this city is to be completed by August 1, and will furnish facilities to crack approximately 2000 barrels of distillates and fuel oil daily. When the project is completed the Texhoma company will have the largest cracking facilities in the North Texas district. Fully 50,000 barrels of additional storage for refined products is also to be added to the Texhoma plant and it is estimated that total improvements to be made will represent an expenditure of $400,000.

Moore Plant Is Ready to Operate on Dubbs Process

Arkansas City, Kans.—Installation of the Dubbs cracking process has been completed at the refinery here of the Moore Refining Company and the plant is now equipped to handle more crude than at any time since the present management took control. The total cost of the new process with equipment is understood to have involved approximately $500,000.

Work on the construction of the Moore Refining Company's additional pipe line connecting the refinery here with the Tonkawa light oil pool in northern Oklahoma is being pushed and the line now is within a few miles of the field.

New Orleans, La.—Operations at the plant of the Sinclair Refining Company at Mereaux south of this city, which was visited by a fire the latter part of March, have been resumed by the Sinclair Refining Company of Louisiana.

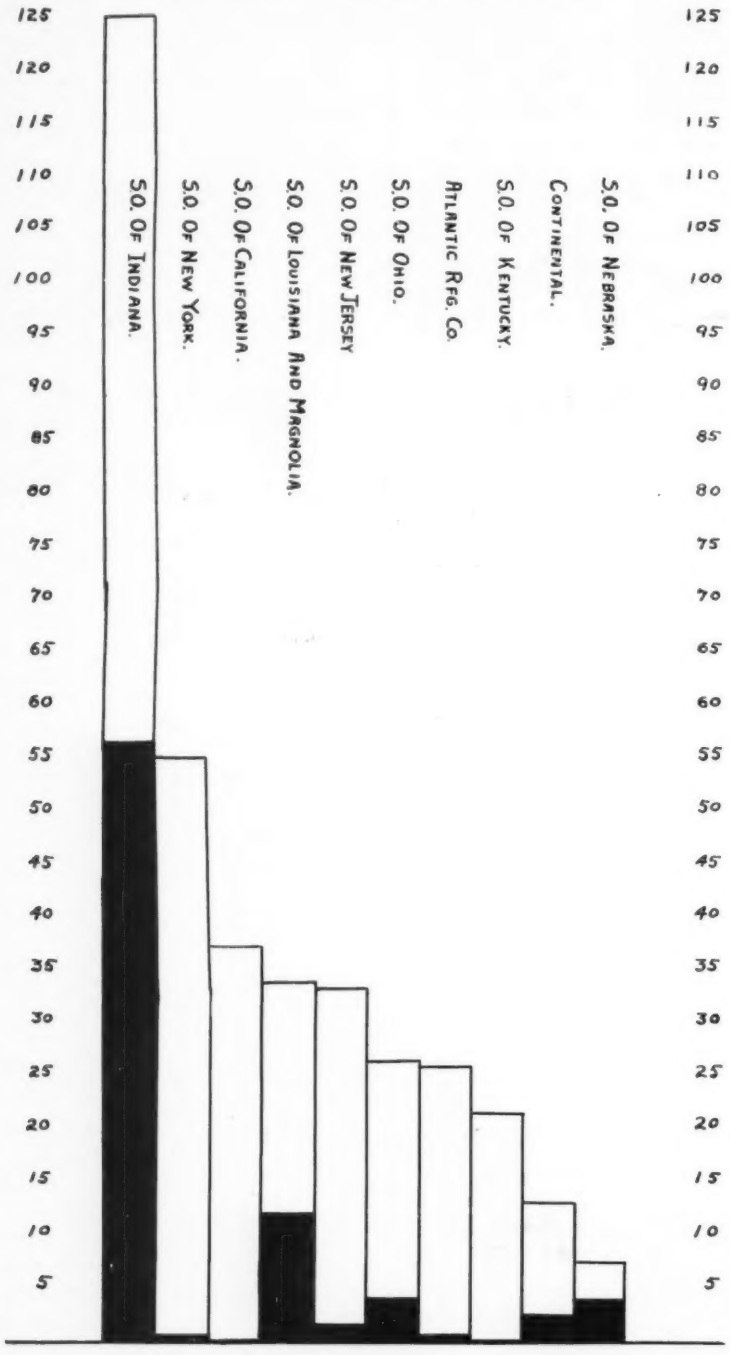
Loss from the fire, which was caused by a bolt of lightning and which destroyed two tanks of 35,000 barrels capacity and eight 1000 barrel distillate tanks, have been placed by company officials at approximately $135,000, which is fully covered by insurance.

Henryetta, Okla.—Plans have been drawn for additions to the East Pitcher Lead and Zinc Company's gasoline absorption plant here. Construction work is expected to commence shortly.

View of the Casper, Wyoming, refinery of the Standard Oil Company of Indiana

Gasoline Last Half of Year 1922

Comparison of domestic consumption with shipments from Oklahoma and Kansas refineries. (Estimated basis figures and method as per the Western Petroleum Refiners Statistical Bulletin No. 14. The white area represents shipments from Oklahoma and Kansas.



Virginia Plant Sold to Oklahoma Man at Auction

Fort Worth, Texas.—The 2500 barrel daily capacity skimming plant of the Virginia Oil and Refining Company at Dublin, Texas, was sold early this month by public sale here to Henry M. Brown of Muskogee, Okla., and others for a cash consideration of $23,500. The plant was erected in 1920 at an estimated cost of $250,000, and was never operated after being tested out. The new owners have not announced whether the plant would be dismantled, or placed in operation at the present location, which is at a disadvantage in getting crude.

New Gasoline Plant Being Built in Wichita County

Wichita Falls, Texas.—The Texhoma Oil and Refining Company with headquarters in this city is erecting a casinghead gasoline manufacturing plant capable of handling 600,000 cubic feet of gas daily on its W. T. Waggoner lease "C" in Section 34, H. & T. C. Block 5, in the South Electra field, Wichita County. The plant will represent an investment of approximately $75,000 when completed in May, and it is planned to add more units as the gas production in the field is increased by developments now underway. The output of the plant is to be piped to Electra, a distance of about 4 miles, and shipped in tank cars.

Benwick to Build Plant In Eastland County Pool

Fort Worth, Texas.—The Benwick Gasoline Company of Kansas City, Mo., has announced that an absorption gasoline manufacturing plant is to be erected shortly on the J. R. Stubblefield tract, section 28, block 4, about three miles southwest of Eastland, Eastland County, Texas. The plant is to be located in the midst of a productive gas field, but the recovery is reported to be somewhat lean as compared with other gas fields in the county where plants are now located. Lewis Bendit and J. W. Chadwick of Kansas City are the principal owners of the Benwick Company.

Midwest Places Order For Seven More Engines

Casper, Wyo.—In carrying out their expansion program the Midwest Refining Company recently placed an order for seven 160 horsepower four cycle Cooper gas engines for direct driven compressors to be installed at the company's Wyoming plant.

The company already has in use three 970 horsepower engines of the four cycle type in operation at the Salt Creek plant. The new order is the second one to be placed with the C. & G. Cooper Company at Mt. Vernon since the first of the year.

Tulsa, Okla.—The Haskell, Okla., refinery of the Southern Oil Corporation has been taken over by the Coleman-Nelson Corporation of Tulsa, which company announces that the plant will be reconditioned and put in readiness to operate. The Southern Oil's Haskell plant has a rated capacity of 1500 barrels daily.

Dallas, Texas.—The Walker Consolidated Petroleum Company, which has a 3000 barrels daily capacity skimming plant located at Iowa Park, Wichita County, Texas, has been placed into the hands of Receiver James E. Gresham, who was appoited by the judge of the United States court in the North Texas district. The plant has been shut down for the past two years, and was under lease by the Lewis Oil Corporation.

Lethbridge, Alberta, Canada.—J. C. Williamson and his associates of Vancouver, B. C., are planning the construction of a refinery here which is to cost $200,000 and which will be operated from crude taken from the Kevin-Sunburst oil district of Northern Montana.

Roxana Has Plan for New Mid-Continent Refinery—Location Not Yet Announced

St. Louis, Mo.—As yet no official announcement has been made from the general offices here of the Roxana Petroleum Company regarding the location of their proposed refinery to be located in the Mid-Continent field where the company has considerable production of light oil. It is understood that plans for the construction of a refinery have been under way for some time and that the total amount of money to be involved will approximate several million dollars, some estimates being as high as $4,000,000, although Roxana officials have not given out any definite information in this respect.

A party of Roxana Petroleum Company officials have completed a tour of inspection of the Mid-Continent field with the idea of determining on a location for their plant and options have been taken on tracts of land in Wichita, Kansas, and Arkansas City, Kansas. Among those who made a tour of the Mid-Continent were Frederick Godber, T. F. Lydon, S. Peterson and Carl Barker, all of St. Louis. Wellington, Kansas, also has offered inducements to the company for locating the proposed refinery at that place which is in the western part of the state.

Options on the land taken at Wichita and Arkansas City are for thirty days so that within the next month some announcement is expected from the general offices here. About 1000 acres are involved in the options at Wichita and a similar size tract has been taken at Arkansas City. These options were obtained through the assistance of the industrial committee of the Wichita Board of Commerce with whom the Roxana officials conferred. Members of the Roxana party were guests of Wichita business interests at a luncheon tendered them during their stay in that city.

Roxana Petroleum has considerable light oil production in Tonkawa which is in northern Oklahoma and easily accessible by pipe line from either Arkansas City or Wichita. Producing offices of the company are located at Tulsa. The Ozark Pipe Line Company is a subsidiary of Roxana Petroleum and operates a complete transporting system connecting the Oklahoma fields with the company's refinery at Wood River, Ill.

The Roxana Petroleum Company is a subsidiary of the recently formed Shell Union Oil Company of Delaware, the controlling stock of which, in turn, is held by the Royal Dutch-Shell interests of The Hague, Holland.

New Concern Organized to Operate Oklahoma Refinery

Ardmore, Okla.—The Santa Fe Oil and Refining Company with headquarters at 60 Broadway, New York, has been organized to take over and operate the refinery of the Chicasaw Refining Company here, which was recently sold at a bankrupt sale to James A. Cotner and associates of New York. Cotner is president of the new company, which will also engage in the producing and other branches of the industry.

Other officers of the company include E. E. Schock of St. Louis, chairman of the board, and George Oliver of New York, secretary and treasurer.

Kansas City, Mo.—The Continental Gasoline Producing Company, which is composed largerly of Kansas City and Topeka interests, has started construction of a gasoline absorption plant in section 4-19-13 in Oklahoma. The plant will have an estimated capacity of between 3000 and 4000 gallons daily.

Cracking Process Will Be Used by Newkirk Refinery

Newkirk, Okla.—A cracking process likely will be installed soon at the Pirtle-Pittman refinery here, which has been taken over by the Sheridan Refining Company of Chicago. The new owners plan extensive improvements at the plant, which include a pipe line connection to Tonkawa and the construction of a pumping station and other additions.

R. S. Ayres of Chicago, representing the Sheridan Refining Company in the deal for the plant, will remove to Newkirk and will be in active charge of the company's operations in this field.

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White Opens St. Paul Branch for Barnsdall

Chicago, Ill.—George D. Locke, vice president, Barnsdall Refining Company, Chicago, announces that they have opened a branch office in Minnesota, located at 739 Pillsbury Avenue, St. Paul, in charge of John T. White. Mr. White is well and favorably known in the Northwest country, having been associated with C. L. Maguire Petroleum Company for a number of years. The Barnsdall Refining Company now has offices in New York, Chicago, Pittsburgh, St. Louis, Kansas City, Tulsa, and Los Angeles, and Mr. Locke is now on a visit to the Los Angeles office and will call on the Pacific Coast representative, Morell Law.

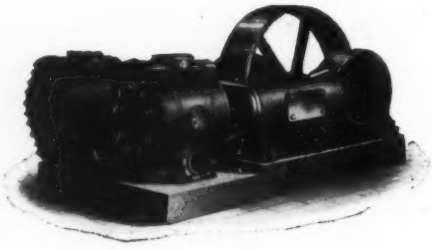
Pure Oil to Use Dubbs At Ardmore Refinery

completed for starting work at Ardmore, Oklahoma, on the installation of a four-unit Dubbs process cracking plant at the Pure Oil Company's refinery located at that place. The total cost of the installation work is estimated at approximately $250,000. The Ardmore plant of the Pure Oil Company operates on Healdton, Oklahoma, crude.

Casper, Wyo.—The Ohio Oil Company has started construction work on a gas absorption plant in the south end of the Salt Creek field in this state, the material for the plant having been moved from the Lance Creek field.

UNION DRY VACUUM PUMPS

For Gasoline Extraction



Capacities From 290 to 5,900 cu. ft. per min.

UNION STEAM PUMP CO.

BATTLE CREEK, MICHIGAN

Study of Still Bottom Failures Is Continued

Washington, D. C.—The study of the cause of oil still bottom failures is being continued at various petroleum refineries by engineers attached to the Mississippi Valley experiment station of the Bureau of Mines, Department of the Interior, at Rolla, Mo. It now seems probable that these failures are properly chargeable to the method of still construction rather than to defective steel.

Waite Phillips Will Use Cross Units at Okmulgee

Okmulgee, Okla.—With the installation of two units of the Cross cracking stills the refinery of the Waite Phillips Company here will be equipped to handle crude of low gravity as well as high grade oil. The capacity of the main plant has been increased from 3000 barrels to 5000 barrels and other improvements made which will entail an expenditure of around $300,000.

It is expected that the additions to the plant will be in operation between April 15 and May 1.

New Absorption Plant Is Being Built at Eastland

Fort Worth, Texas.—An absorption gasoline manufacturing plant capable of handling 5,000,000 cubic feet of gas daily is being erected by the Arkansas Natural Gas Company on the C. L. Downtain lease in the Lake Eastland field, Eastland County, Texas. The plant is located in the southwest corner of section 25, H. & T. C. survey, Block 4. It will have two units, and two 110 h. p. Bessemer gas engines that the company was using to flow wells by air in the Arkansas field have been installed in the plant.

Port Au Prince, Haiti.—A portion of the business district here was damaged by fire March 14, which is believed to have started in a building owned by The Texas Company in which oil stocks were carried. The Texas Company's building and oil were covered by insurance.

Oklahoma Plant Damaged By Gasoline Explosion

Coffeyville, Kan.—The gasoline plant of the Henderson Gasoline Company at Delaware, Oklahoma, some eighteen miles from here, was partially destroyed by fire April 11 as the result of an explosion of gasoline. The loss has been estimated at approximately $50,000.

Tulsa, Okla.—The Phoenix Refining plant at Sand Springs near here is being reconditioned preparatory to being placed in operation. The Phoenix refinery is under the control of the Chestnut and Smith Corporation of Tulsa.

Muskogee, Okla.—The Pure Oil Company has completed the taking over of the Muskogee refinery of the Oklahoma Producing and Refining Corporation located here and which has recently been shut down.

Congealing Temperatures of Cracked Residue

(Continued from Page 20)

creases. Examination of the viscosities of the oils of Mid-Continent origin will show that in general this may be true. With pure hydrocarbons or mixtures of pure hydrocarbons, of the same homologous series, there is no doubt that the statement holds.

Pribam and Handl[2] found that the specific viscosities of isomers frequently differ and that substituents in the compounds, as well as their position in the molecule, influence the viscosity. Since in these experiments we are not dealing with pure compounds but with complex mixtures, it is difficult to tell just what factors are affecting the physical properties of the materials examined. However, it can be definitely stated with regard to the residua examined that the congealing temperatures do not seem to be a function of the physical properties, namely, the specific gravity or the viscosity. It is therefore probable that the congealing temperature is a function of the composition. Very little is known about the composition of these cracked residua and it is beyond the scope of the present paper to go into this point. However, the following relationship between fusibility of substances and their chemical composition may be pointed out.

Carnelly[3] found that, as with many other properties of the elements, the melting point is a function of the atomic weight. With organic compounds in general the melting points of the members in the homologous series show a tendency to increase with increasing molecular weight, although the increase in melting point is not regbecomes constant; that is, from hshrdle ular. In the paraffin series with the addition of a CH_2 group there is an alternate constant increase in the melting point, which in the higher member becomes constant; that is, from C_8 to C_{24} the increase is about 0.4°.

Franchimont[4] found that replacement causes changes in the melting point; that is, the introduction of oxygen into the molecule usually causes an increase in the melting point.

The introduction of a methyl group in place of hydrogen which is attached to oxygen, nitrogen and sulphur, causes a lowering of the melting point.

With regard to isomeric compounds, Carnelly[5] showed that of two isomeric compounds that which contains the more symmetrical structure possesses the highest melting point. In general, however, it may be concluded that the property of fusibility is highly constitutive, and that much work would have to be done in connection with cracked residuum oils in order to discover definite relationships. In addition it must be remembered that the properties of cracked residuum oils are in a great measure influenced by the conditions under which these residua are produced, and that for a given charging stock the viscosities, gravities and congealing temperature may be varied over a wide range. However, it is to be pointed out that the cracked residua discussed here are products of typical commercial scale reactions in the production of gasoline from various charging stocks, and that as such they possess industrial significance with regard to their use as fuel.

Regarding the caliorific values of the various oils as determined here is to be pointed out that they are compared in terms of B. T. U.'s per pound, as well as B. T. U.'s per gallon.

In addition to the advantage of low congealing temperature and viscosities, cracked residua show a higher calorific value per gallon, than the oils from which they were derived.

Summary

1. The heavy hydrocarbon oils (petroleum, crude and fuel oils) should be cracked into gasoline and fuel oils and not burned as fuel.
2. The fuel oil resulting from cracking has a greater economic value than the oil from which it was derived.
3. The commercial scale operation of cracking has produced fuel oil of a much lower congealing temperature than the oil processed.
4. The viscosity of the cracked residue is lower than that of the oil processed.
5. The Baume gravities of the fuel oil resulting from cracking in each case was lower.
6. The British Thermal Units per gallon of the fuel oil resulting from cracking were higher than the oil processed.

[2]Wein. Ber. 78, 1133, 1878; 80, 17, 1879; 84, 717, 1881.
[3]Phil. Mag. (5) 8, 315, 1879; (5) 18, 1, 1884.
[4]Rec. Pays. Bas. 16, 126 (1897.)
[5]Ibid. (5) 13, 116, (1882.)

Work on Enlarging Utah Refinery Now Under Way

Salt Lake City, Utah.—Construction work on the Utah Oil and Refining Company's plant here is progressing and three high pressure stills are being built in connection with the installation of a new process for refining oils.

This work is a part of the expansion program which is being carried out by the Utah Oil and Refining Company and which likely will involve around $550,000.

Gas Men Discuss Gasoline Recovery at Annual Meet

Louisville, Ky.—An interesting feature at the annual meeting of the Natural Gas Association of America, which was held here April 16 to 19, was the discussion given to the recovery of natural gasoline. A subcommittee appointed some time ago at St. Louis has been organized to deal with this problem and members of the committee have started work on an attempt to standardize an apparatus to be used in making tests of gasoline content in natural gas.

Some of the leaders in industrial affairs of this country are assisting members of the subcommittee on gasoline recovery and are working in conjunction with the Natural Gas Association of America. These leaders include Messrs. Dow of the United States Bureau of Mines, Shepard of the United States Bureau of Standards and Saybolt, Cooper and Chew, men who were associated in the original work on gasoline recovery.

Members of the subcommittee who are dealing with this subject and who are representing the Natural Gas Association of America include T. H. Kerr of the Ohio Fuel Supply, E. F. Schmidt of the Lone Star Gas Company, J. B. Garner and C. C. Reed of the Hope Natural Gas Company, C. W. Melton of the Liquified Petroleum Gas Products Company, R. P. Anderson of the United Natural Gas Company, R. N. Parks of the United Fuel Gas Company, R. E. Peck of the Empire Companies and Col. R. E. Durrell.

East St. Louis, Ill.—A huge gasoline tank owned by the Indiahoma Refining Company near here exploded March 17 and approximately 40,000 gallons of gasoline were destroyed by fire. The explosion is believed to have been caused by internal combustion.

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The Vilter Manufacturing Co.

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Builders of Refrigerating Machinery, Oil Cooling Coils, Gasoline Condensers, Etc.

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Vilter-Milwaukee typifies the true standard of reliability in machinery construction and refrigerating engineering.

Vilter Low Temperature Compression System (for efficiently producing low temperatures with compression system.)

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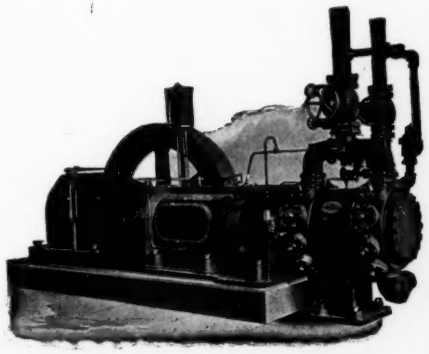

÷ REFINERY SUPPLIES ÷

Chemical Market Continues Healthy— Prices Show Further Upward Tendency

Chicago, April 16.—The market on chemicals, animal, fish and vegetable oils, and naval stores, generally, may be characterized as stronger, practically all items being either firm at prices that prevailed a month ago, or higher in price.

Among chemicals of interest to refiners Potash Permanganate continues to hold the center of the stage. The strength reported last month has become more and more pronounced from week to week since, and price has advanced from around 18 to 26 in four weeks. The spot market is now reported as nearly bare of goods. Imported material has all been cleaned up, with the exception of a few small lots. Shipments are very uncertain, guaranteed March arrivals have not yet come to hand. A strong demand continues to prevail.

Potash Permanganate and Nitrate of Soda have advanced somewhat in price. Silicate of Soda advanced slightly in price at one period during the month, but producers later re-established the former price levels.

Among miscellaneous oils the position of Linseed is unusually strong. Throughout the north production has been far below normal, with makers largely avoiding offers of carload quantities. Demand on the contrary has been exceedingly active. This general situation it is anticipated will prevail for several months. Price has consequently advanced 18 points in 30 days, the gallon price on carloads in barrels being now $1.14.

A not dissimilar situation is presented in the case of Menhaden Fish Oil, the old crop being completely cleaned up, whereas demand is active. Contracts are being made on an "if and when manufactured" basis. Price advanced approximately 4 cents.

Lard, Horse, Soya Bean and Castor oils show advances during the month of a cent or less. Most other animal, fish and vegetable oils are selling at small fractions of a cent higher. Sperm Oil shows no advance, but is firm at the recent decline.

Turpentine has registered a steady advance. Southern markets have been generally firmer, stocks are reported as small, while paint manufacturers are known to be unusually busy. Construction work in progress and planned for the next 6 months indicates that paint consumption should be unprecedented this season.

Other Naval Stores have remained at former price levels, with the exception of rosin which has shown a slight advance in sympathy with turpentine.

OIL JOBBERS SUPPLIES

Prices based on original packages in large quantities f. o. b. manufacturing point—unless otherwise specified.

Animal, Fish and Vegetable Oils	Price Apr. 14
Lard Oils	
Prime, bbls., lb.	15½
Extra Winter Strained, bbls., lb.	14¼
Extra, bbls., lb.	14
Extra No. 1, bbls., lb.	13¼
No. 1, bbls., lb.	13
No. 2, bbls., lb.	12¾
Tallow, prime edible, lb.	10¾
Tallow Oil, acidless, bbls., lb.	13¾
Lard Stearine, bbls., lb.	14¼
Oleo Stearine, bbls., lb.	11
Neatsfoot Oil—	
Pure 20 cold test, bbls., lb.	18½
Pure 30. cold test, bbls., lb.	16½
Extra, bbls., lb.	13½
No. 1, bbls., lb.	13¼
Horse Oil, bbls., lb.	10
Red Oil, distilled, bbls., lb.	11½
English Degras, bbls., lb.	4½ 4¼
Domestic Degras, bbls., lb.	4¾ .05
Menhaden Fish Oil—	
Light Pressed, bbls., gal.	.75 .77
Yellow bleached, bbls., gal.	.77 .79
Herring Oil, tanks, coast, gal.	.50
Whale Oil, bleached, bbls., gal.	.75
Sperm Oil, bleached, bbls, gal.	.89 .94
Soya Bean Oil, pressed, bbls., lb.	13¼
Soya Bean Fatty Acids, tanks, West, lb.	14¼
Tallow Fatty Acids, bbls., lb.	.07 .07½
Castor Oil—	
No. 1, bbls., lb.	14¼
No. 3, bbls., lb.	14
Corn Oil—	
Middle West, tanks, lb.	10½ 10¾
Cooperage, l. c. l.	12½
Linseed Oil—	
Carloads, bbls., gal.	$1.14
Less than 5 bbls., gal.	1.20

NAVAL STORES

(Quotations by National Rosin Oil & Size Company, Chicago.)

Rosins—		
B. to I, bbls., (280 lbs.)	$6.20	$6.30
10-20 bbl. lots, f. o. b. shipping point	7.40	...
K to WW bbls., (280 lbs.)	6.35	8.00
10-20 bbl. lots, f. o. b. shipping point	7.30	9.40
Turpentine, spirits ex yard gal.		$1.61
In drums		1.59
Rosin Oil, first run, gal.		.46
Rosin Oil, second run, gal.		.48
Rosin Pitch, bbl.		6.00
Tar, kiln burned		13.50
Tar, retort		12.50

REFINERS' SUPPLIES

Prices are based on original packages, in large quantities, and represent spot quotations, unless otherwise stated, f. o. b. manufacturing points.

(Quotations by Wishnick-Trumpeer Chem. Co., Chicago.)

Soda Ash, light bags, cwt.	1.75	2.10
Silicate of Soda, 60 deg., tanks cwt.	1.60	1.75
Sal Soda, cwt.	1.10	1.30
Caustic Soda, 76% drums, cwt.	3.50	3.75
Chlorate of Soda, kegs, lb.	6½	7
Nitrate of Soda, cwt.	2.65	2.67
Potash Permanganate	.25	27
Potash Bichromate, sacks, lb.	10¾	11¼
Sulphuric Acid, 66 deg., tank cars ton	.14	.16
Acetic Acid—		
28%, bbls., lb.	.03¼	.04
56%, bbls., lb	.06¼	.07
80%, bbls., lb.	.09¾	.10¼
Fullers Earth, 16-30 mesh, carloads, ton	$23.00	25.00
Chloride of Lime, cwt.	2.00	2.25
Benzol, pure, water white, gal.	.30	.35
Benzol, 90%, gal.	.27	.33
Toluol, gal.	.30	
Litharge		
Chicago market, bbl.		$10.90

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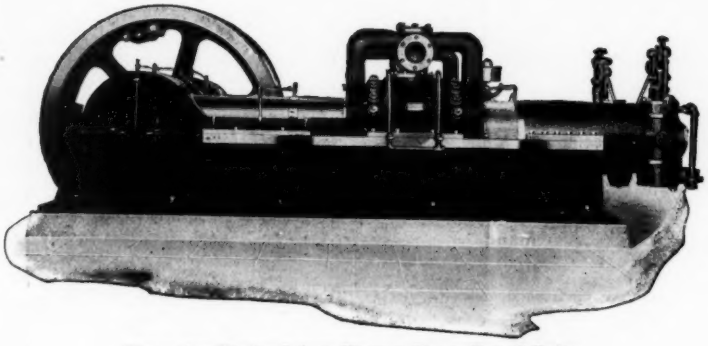


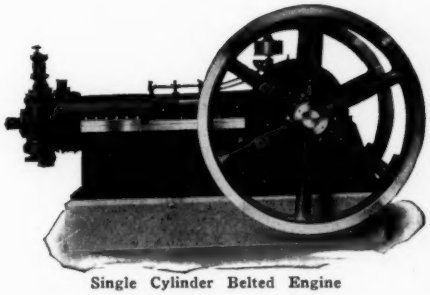
Direct Gas Engine Driven Vacuum Pump, Two Cylinder

Watts-Miller Gas Engines and Direct Gas Engine Driven Compressors and Vacuum Pumps

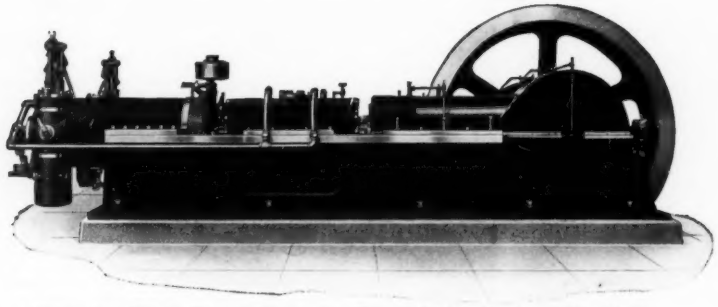
Pat. June 22, 1897; Oct. 6, 1914; April 13, 1915

High Efficiency Gas Engines, Compressors, and Vacuum Pumps for Power Plant Equipment

Sizes from 25 to 400 h. p.



Single Cylinder Belted Engine



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Compressors particularly adapted to casing-head gasoline plants, gas pumping plants, and compressed air installations, in single and 2-stage machines to operate on practically all intake and discharge pressures. Continuous circulating filtering automatic oiling system.

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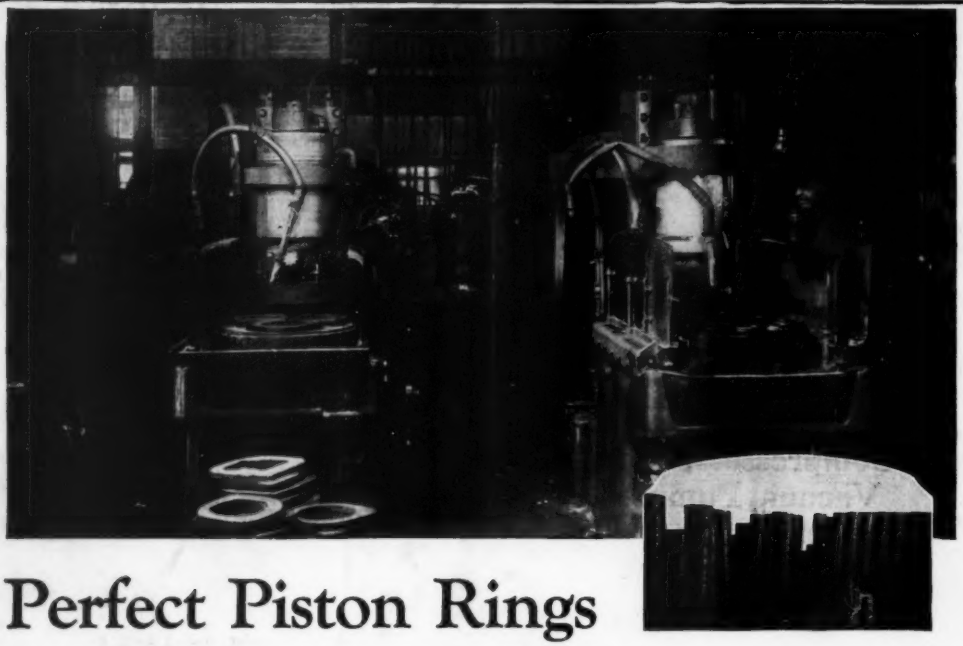

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To help maintain this high standard Bessemer engineers cast each piston ring *individually*. The inside diameter is cast to size and only a grinding finish left on the other sides. The inside of the ring is left unground so that the close hard scale on this side may be retained. This adds much to the life of the ring.

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